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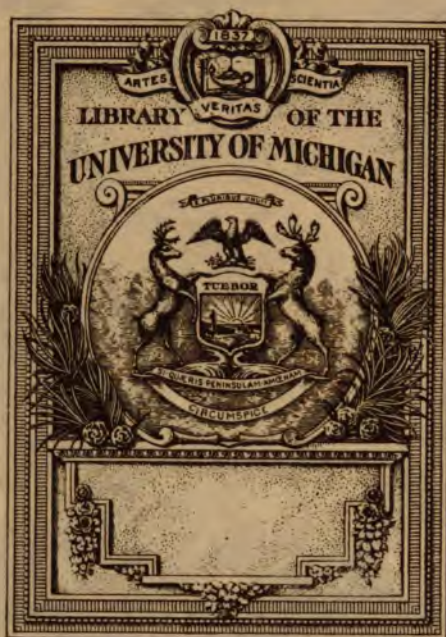
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U.S. Bureau of Commerce Measurement of Vessels



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DEPARTMENT OF COMMERCE

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BUREAU OF NAVIGATION (Dep't of Commerce)

MEASUREMENT OF VESSELS

REGULATIONS INTERPRETING LAWS RELATING TO
ADMEASUREMENT OF VESSELS, TOGETHER
WITH THE LAWS OF UNITED STATES
AND THE SUEZ CANAL
REGULATIONS

JULY 13, 1915



WASHINGTON
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DEPARTMENT OF COMMERCE,
BUREAU OF NAVIGATION,
Washington, July 13, 1915.

To collectors of customs and others concerned:

The following regulations interpreting the laws relating to the admeasurement of vessels, together with the laws of the United States and Suez Canal regulations on the subject, are printed for the guidance of those concerned.

E. T. CHAMBERLAIN,
Commissioner.

Approved:
WILLIAM C. REDFIELD,
Secretary.

MEASUREMENT OF VESSELS.¹

Part I.—INSTRUCTIONS FOR THE TONNAGE MEASUREMENT OF VESSELS.

PRELIMINARY.

ARTICLE 1. (a) Before any vessel shall be registered, enrolled, or licensed she shall be measured by an officer of the customs at the place where she may be.

(b) A vessel is not to be measured unless she is required by law to be registered, enrolled, or licensed, or otherwise specially provided for.

(c) The Commissioner of Navigation is charged with the supervision of the laws relating to the admeasurement of vessels, and on all questions of interpretation growing out of the execution of the laws relating to this subject his decision is final. (Act of July 5, 1884.)

GROSS TONNAGE.

PRINCIPAL DIMENSIONS.

ART. 2. (a) The marine document of every vessel shall show the date and place of build; the register length, breadth, depth, and, in vessels of more than two decks, the height under the third or spar deck; the number of decks and masts; build as to her head and stern; capacity under the tonnage deck, that of the between decks, and also, separately, permanently inclosed spaces on the upper deck to the hull, available for cargo or stores or for the berthing or accommodation of passengers or crew, and the omitted spaces on or above the upper deck; gross tonnage; items of deduction; and net tonnage.

(b) All measurements are to be taken in feet and fractions of feet, and all fractions of feet shall be expressed in decimals.

TONNAGE DECK.

ART. 3. (a) The tonnage deck in vessels having three or more decks to the hull shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage deck.

(b) If the second deck from the keel consists of several partial decks extending with breaks from stem to stern, the line of that course of decks must be taken as the tonnage deck; and if the partial decks are at different heights, the line of the lowest will be taken as the tonnage deck, and the head room above such line under the higher will be measured.

¹ Diagrams will be printed as inserts for the second edition.

REGISTER LENGTH.

ART. 4. (a) The length from the fore part of the outer planking on the side of the stem to the after part of the main sternpost of screw steamers—i. e., the one to which the rudder is attached—and to the after part of the rudderpost of all other vessels measured on the top of the tonnage deck shall be accounted the vessel's length.

(b) The register length of scows and barges with a square bow and stern sloping up from the bottom to the deck and with neither stem, sternpost, nor rudderpost is to be taken on the deck from the extreme point of the hull at the bow to the extreme point of the hull at the stern—i. e., the overall length of the hull is to be considered the register length of such vessels.

BREADTH OF BEAM.

ART. 5. The breadth of the broadest part on the outside of the vessel shall be accounted the vessel's breadth of beam, and is to be taken by means of plumb lines let fall so as to touch the sides of the vessel or by other practical means.

DEPTH OF HOLD.

ART. 6. (a) The register depth is to be taken from the under side of the tonnage-deck plank, midship, to the ceiling in the hold, average thickness, at the side of the keelson, in a direction perpendicular to the keel, which may be done by means of a square placed upon the upper side of the keelson.

(b) If the vessel has a third deck, then the height from the top of the tonnage-deck plank to the under side of the upper-deck plank shall be accounted as the height under the spar deck.

GROSS TONNAGE.

ART. 7. (a) The tonnage measurements are taken for the purpose of ascertaining the internal capacity of measured spaces of vessels in tons of 100 cubic feet each, which measurers should proceed to find as soon as the vessel is sufficiently advanced in construction as to permit its being done, usually when the decks are laid or deck beams placed in position and the hold sufficiently cleared of material, etc.

(b) In case of steam vessels, the hold should be measured before the boilers and machinery are installed and the tanks filled with water.

(c) The gross tonnage of a vessel shall consist of the sum of the following items: (1) The cubical capacity below the tonnage deck; (2) the cubical capacity of each space between decks above the tonnage deck; (3) the cubical capacity of the permanent closed-in spaces on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew; (4) the "excess of hatchways"; and (5) all permanent closed-in spaces wherever situated available for cargo or stores, or for the accommodation of the crew, or for the charts and navigating instruments, or for wireless apparatus or berthing and accommodation of the operator (except cabins or state-rooms for passengers constructed entirely above the first deck which is not a deck to the hull [R. S. 4151]).

UNDER-DECK TONNAGE.

The cubical capacity below the tonnage deck is to be ascertained as follows:

TONNAGE LENGTH.

ART. 8. (a) Measure the length of the vessel of usual sheer on the upper side of the tonnage deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern timbers or frames (average thickness, or inside of angle irons or frames in iron ships not ceiled), deducting from this length what is due to the rake of the bow in the thickness of the deck and what is due to the rake of the stern timber or frame in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam.

(b) It may, however, sometimes be impracticable to ascertain either of the terminal points of the tonnage length on the upper side of the deck. In such cases the same result may be more conveniently reached by taking the length below the tonnage deck, from the inner planking under the deck hook, at the side of the stem to the inner planking on the stern timbers or frames; adding the rake of the bow in the thickness of the deck hook and the rake of the stern in the thickness of the deck timbers or frames.

(c) Divide the length so taken into the number of equal parts required by the following definition of classes, according to the class to which the vessel belongs (R. S. 4153), marking with chalk or otherwise the points so fixed and numbering them consecutively from bow to stern, No. 1 at the bow.

Class 1. Vessels of which the tonnage length according to the above measurement is 50 feet or under: Divide into six equal parts.

Class 2. Vessels of which the tonnage length according to the above measurement is above 50 feet, and not exceeding 100 feet long: Divide into eight equal parts.

Class 3. Vessels of which the tonnage length according to the above measurement is above 100 feet, and not exceeding 150 feet long: Divide into ten equal parts.

Class 4. Vessels of which the tonnage length according to the above measurement is above 150 feet, and not exceeding 200 feet long: Divide into twelve equal parts.

Class 5. Vessels of which the tonnage length according to the above measurement is above 200 feet, and not exceeding 250 feet long: Divide into fourteen equal parts.

Class 6. Vessels of which the tonnage length according to the above measurement is above 250 feet: Divide into sixteen equal parts.

BREAKS IN DOUBLE BOTTOM.

(d) In the case of a break or breaks in a double bottom, the length of the vessel is to be taken in parts according to the number of breaks, and each part is divided into a number of equal parts according to the class in the above table to which such length belongs. The tonnage depth of the middle of the tonnage length will determine the number of parts into which all the remaining tonnage depths are to be divided. The register depth of the vessel is also to be taken at this point.

TRANSFER OF SECTIONS TO KEELSONS.

ART. 9. (a) The tonnage length having been determined, and the number of sections to be measured and the interval between them ascertained, a line is then to be extended down the main hatchway, at the middle line of the ship, in a direction perpendicular to the keel, by means of a square placed on the upper side of the keelson.

(b) The distance of the midship section from this line at the tonnage deck is then to be set off from the line in the same direction on the keelson, which gives the position of the midship section on the keelson, and the positions of the other sections are obtained on the keelson by setting off afore and abaft of the midship section the common interval between them as already determined.

ROUND OF BEAM.

ART. 10. (a) The round-up or spring of the beam, which must be known before taking the exact length of the vessel, as well as before measuring the depths of the areas, may be taken either at the under side of the deck, by stretching a small line tightly from end to end of the top of the beam, which will show the round or spring of the beam at the center; or it may be taken, if more convenient, at the upper side of the deck, by stretching a line tightly across, held at equal heights from the deck at each side of the ship, so as just to touch the crown of the deck at the middle line; then the distance from the deck to the line at the ship's sides gives the round-up or spring of the beam. It is necessary to take the round of beam at each point of division of the length except when the vessel has a parallel or nearly parallel breadth. In lieu of the above methods, it may be ascertained on the basis of one-fourth of an inch to the foot of beam at each section in iron or steel vessels of the usual camber of beam. This method is more accurate and easier of application than the others.

(b) The round or spring of the beam is the perpendicular distance from the crown of the under side of the tonnage-deck plank, at the center, to a line stretched athwart the vessel from end to end of the top of the beam, and is to be ascertained at every place where it is to be used in the measurement.

TRANSVERSE AREAS.

Art. 11. (a) Then the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, set up the sliding rods with the intervals of breadths marked thereon and find the transverse area of such vessel at each point of division of the length as follows:

(b) Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below the tonnage deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling, which is between the bilge planks and limber strake.

(c) Then if the depth of the midship division of the length do not exceed 16 feet, divide each depth into four equal parts.

(d) Then measure the inside horizontal breadth at each of the three points of division and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling or cargo battens which are between the points of measurement, or, should there be no ceiling or battens between these points, to the inside of the ordinary frames, not to the web or strengthening frames.

(e) Number these breadths from above, numbering the upper breadth 1 and so on down to the lowest breadth.

(f) Multiply the second and fourth by 4 and the third by 2.

(g) Add these products together and to the sum add the first breadth and the last, or fifth.

(h) Multiply the quantity thus obtained by one-third of the common interval between the breadths and the product shall be deemed the transverse area.

(i) But if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before, multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths and the product shall be deemed the transverse area.

(j) This process will be repeated at every section. Care should be taken in all measurements to bring them to the average thickness of the ceiling to avoid any device to lessen the measurement by making the ceiling thicker at the point cut by the sections. Care must also be taken that the sections shall be parallel to each other and at right angles to the axis of the vessel.

(k) The bottom breadths are to be taken only so far as the apparent flat of the floor extends. Where there is perceptible rise immediately from the keelson, the bottom should be taken equal to the width of the keelson.

(l) The intervals and one-third intervals of the breadths are to be carried to the nearest hundredth of a foot, and the interval and one-third interval of the length to the nearest thousandth of a foot.

SIDE WATER-BALLAST TANKS.

ART. 12. In vessels having side water-ballast tanks extending up from the top of the double bottom wholly or partly to the deck above and certified by the collector to be available for water ballast only, the breadths should be taken to the inside of said water-ballast tank.

EXTENDED DOUBLE BOTTOMS.

ART. 13. When the extended double bottom stops short of the tonnage deck, divide each cross section in way of it into two parts, one extending from the top of the double bottom to its termination on the side and the other from this point to the tonnage deck above; then find the area of each part separately as provided for finding the areas of cross sections and add together the areas of the two parts to get the total area of the cross section.

DOUBLE BOTTOMS.

ART. 14. (a) In the case of a vessel constructed with a double bottom the depth shall be taken from the underside of the tonnage deck to the upper side of the inner plating of the double bottom, allowing for ceiling, if any, thereon.

(b) When the top of the double bottom is not horizontal but sloping up immediately from the center divide the depths into five or seven equal parts, according as the midship depth is 16 feet or less or more than 16 feet. If said depth do not exceed 16 feet, divide each depth at the point of division of the length into five equal parts; then measure the inside horizontal breadth at each of the four points of division and also at the upper point of the depth, extending each measurement to the average thickness in that part of the ceiling which is between the points of measurement. Number these breadths from above (i. e., numbering the upper breadth 1, and so on down to the fifth breadth); multiply the second and fourth by 4, and the third by 2; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area of the upper part of the section.

(c) Then find the area between the fifth and lower point of the depth by dividing the depth between such points into four equal parts, and measure the horizontal breadths at the three points of division and also at the upper and lower points, and proceed as before, and the sum of the two parts shall be deemed to be the transverse area.

(d) But if the midship depth exceed 16 feet, divide each depth into seven equal parts instead of five, and measure, as before directed, the horizontal breadths at the six points of division, and also at the upper point of the depth; number them from above, as before; multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together, and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area of the upper part of the section; then find the lower part of the area as before directed, and add the two parts together, and the sum shall be deemed the transverse area.

(e) Vessels with horizontal double bottoms are to be measured under the ordinary rule.

DOUBLE BOTTOMS WITH CARGO, STORES, OR FUEL.

ART. 15. (a) If the space between the inner and outer plating of the double bottom is available only for water ballast, it is exempt from measurement; but if it is available for carrying cargo, stores, feed water, coal or other fuel, it is to be measured according to the Moorsom rules and added to the space between it and the tonnage deck above.

(b) The depth of double-bottom spaces used other than for water ballast is to be taken from the top of said space to the top of ordinary floors, if any; otherwise an allowance shall be made for floors measured from the shell plating upward alongside of the center through-plate keelson as follows:

For vessels whose beam is 15.5 to 16.5 feet, 0.75 foot; 16.5 to 17.5 feet, 0.8 foot; 17.5 to 19 feet, 0.9 foot; 19 to 22.5 feet, 1 foot; 22.5 to

24.5 feet, 1.1 feet; 24.5 to 26 feet, 1.2 feet; 26 to 28 feet, 1.25 feet; 28 to 29 feet, 1.3 feet; 29 to 31 feet, 1.4 feet; 31 to 32 feet, 1.5 feet; 32 to 33 feet, 1.6 feet; 33 to 34 feet, 1.7 feet; 34 to 35.5 feet, 1.75 feet; 35.5 to 36.5 feet, 1.8 feet; 36.5 to 38 feet, 1.9 feet; 38 to 42 feet, 2 feet; 42 to 44 feet, 2.1 feet; 44 to 46 feet, 2.2 feet; 46 to 47.5 feet, 2.25 feet; 47.5 to 49 feet, 2.3 feet; 49 to 51 feet, 2.4 feet; 51 to 52.5 feet, 2.5 feet; 52.5 to 53.5 feet, 2.6 feet; 53.5 feet to 55 feet, 2.7 feet; 55 to 56.5 feet, 2.75 feet; 56.5 to 57.5 feet, 2.8 feet; 57.5 to 59 feet, 2.9 feet; 59 to 60 feet, 3 feet; etc.

(c) This schedule of floor depths applies to vessels whose molded depth—i. e., the depth from the top of the keel to the upper, or main, deck—is at least 55 per cent of the breadth; for vessels whose molded depth is less than 55 per cent of the breadth, apply to the Bureau of Navigation for instructions.

BULK-OIL CARRIERS.

ART. 16. In bulk-oil carriers, take the depth from the tonnage deck to the shell plating, less the aforesaid allowance for floors and one-third of the round of the beam. To find the number of sections of the addable double bottoms, divide them by 2 or some multiple of 2 as will make the distance asunder of the sections as nearly equal as possible to that in the tonnage length of the vessel or the part in which located.

CUBICAL CONTENTS UNDER TONNAGE DECK.

ART. 17. (a) Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

(b) Number the areas successively 1, 2, 3, etc., No. 1 being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern.

(c) Then, whether the length be divided according to the table, into 6 or 16 parts, as in classes 1 and 6, or any intermediate number, as in classes 2, 3, 4, 5, multiply the second and every even-numbered area by 4, and the third and every odd-numbered area, except the first and last, by 2.

(d) Add these products together and to the sum add the first and last, if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck.

(e) Divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed to be the register tonnage of the vessel, subject to the additions hereinafter mentioned.

SPECIAL EXEMPTED WATER-BALLAST PEAKS, ETC.

ART. 18. Any space other than the double bottom space used only for water ballast, certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel, shall be deducted from the gross tonnage, as measured, to get gross register tonnage. (Act of Congress, Feb. 6, 1909.)

BETWEEN DECKS.

If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

ART. 19. (a) Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern when ceiled, but if there is no ceiling, take the length in the manner directed for taking tonnage lengths in such cases. Divide the length into the same number of equal parts into which the length of the tonnage deck is divided.

(b) Measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth of the stern (if round, as in the case of poops of similar form); number them successively, 1, 2, 3, etc., commencing at the stem; multiply the second and all other even-numbered breadths by 4 and the odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths and the result will give, in superficial feet, the mean horizontal area of such space.

(c) Measure the mean height between the planks of the two decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel, ascertained as aforesaid.

(d) If the vessel has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as aforesaid.

HATCHWAYS.

ART. 20. The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of the beam to the underside of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage and the remainder only shall be added to the gross tonnage of the ship exclusive of the tonnage of the hatchways.

DECK HOUSES AND SPACES ON THE UPPER DECK.

ART. 21. (a) Nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather—that is, not inclosed.

(b) If there be a break, a poop, or any other permanent closed-in space on or above the upper, or spar deck, available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of such space (except the cabins and staterooms for passengers on a deck not to the hull exempted by law) shall be ascertained as follows and added to the tonnage of the vessel:

(c) Measure the internal mean length of such space in feet and divide it into an even number of equal parts, of which the distance asunder shall be most nearly equal to that of the parts into which the tonnage deck has been divided.

(d) Measure at the middle of its height, the inside breadths, namely, one at each end and at each of the points of division, numbering them successively 1, 2, 3, etc., then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last.

(e) Multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space.

(f) Then measure the mean height between the planks of the decks, and multiply by it the mean horizontal area, divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage deck ascertained as aforesaid.

AFTER BREADTHS OF POOPS ON ROUND-STERN SHIP.

ART. 22. If the afterpart of an ordinary poop is elliptical make the breadth at the aft (extreme) end equal to one-half of the preceding one, but if it is round as usually found on lake vessels two-thirds of the preceding one. Take the length of said space along the middle line from the inside of the frames, or stiffeners, of the forward bulkhead to the inside of the stern frame when no ceiling is present. Make division of the length as aforesaid. Measurements of the other unceiled addable erections on or above the upper deck are to be taken inside of the frames, or stiffeners, of the same.

DECK ERECTIONS.

ART. 23. (a) In deciding whether or not deck erections are permanent closed-in spaces on the upper deck and should be measured and added to the tonnage, the measurer should have regard to the character and structural condition of such erections on the upper deck at the time when they are presented to his notice.

(b) PooPs, bridges, or any other erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing, but otherwise so closed in as to be not only available but also actually fitted and used for the berthing or accommodation of passengers, must be measured and added to the tonnage.

CLOSED-IN SPACES WHICH MAY BE EXEMPTED.

ART. 24. The following exceptions to the general rule of measuring all closed-in or weather-protected spaces on or above the upper deck are allowed:

(a) Any closed-in space or spaces solely appropriated to and fitted with machinery.

(b) The wheelhouse for sheltering the man or men at the wheel.

(c) The cookhouse and also the bakeries when fitted with ovens and used entirely for such purposes.

(d) The condenser space.

(e) Water-closets or privies for the officers and crew; and in the case of vessels fitted particularly for passengers, an additional one may be allowed for every 50 persons; not more than 12 are, however, generally necessary.

Provided always that the spaces are no larger than required for the purposes mentioned.

SHELTER-DECK SPACES.

ART. 25. (a) Subject to the foregoing exception, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing them, should not be measured and included in the tonnage.

(b) The minimum width and height of the permanent openings in the bulkheads is fixed at 3 feet and 4 feet, respectively, and if coamings are fitted thereto their height must not exceed 2 feet.

(c) A single opening at one side of a bulkhead is not considered sufficient to entitle the space thus partitioned off to exemption, unless, in addition to this, there are a number of freeing ports and scuppers fitted on each side of the space claimed. In such cases the owner's application for exemption and also a sketch of the space drawn to scale must be forwarded to the Commissioner of Navigation for examination, and exemption must not be allowed without the Bureau's approval.

(d) When exemption from measurement is claimed for the space between the upper and shelter decks on the ground of a permanent middle line opening in the shelter deck, the length of this opening must not be less than 4 feet clear, and the width must at least be equal to that of the after cargo hatch upon the same deck. The distance between the after edge of the deck opening and the aft side of the sternpost must not be less than one-twentieth the registered length of the vessel, or if the opening is placed forward, the foreside must not be less than one-fifth the length of the vessel from the stem. When the permanent deck opening is situated aft, there must be at least two openings in all the transverse bulkheads in the between decks on the foreside of it to entitle the space to exemption, and these openings must comply as regards dimensions and size of coamings (if any) with the requirements of paragraphs (b) and (c) above.

(e) There must also be on each side at least one freeing port of good size abreast the deck opening and a suitable number of scuppers not less than $3\frac{1}{2}$ inches in diameter distributed throughout the space.

(f) The coamings to the deck opening must not exceed 12 inches mean height above the deck, and the opening must be fenced with guardrails and stanchions, the latter being so fitted as not to lend themselves to battening down the opening.

(g) If portable wood covers are fitted, the lashings beneath for holding them down are to be of hemp.

(h) All openings in the upper deck must be provided with proper means for closing and battening down.

SHELTER FOR DECK PASSENGERS.

ART. 26. Cabins and staterooms immediately on the upper deck to the hull, permanently "closed in" and fitted up for permanent use of passengers, are to be included in the gross tonnage. They will be exempted only when they have no berthing accommodations and have only temporary arrangements to protect passengers on short voyages from rain and the shipment of seas, constituting sheltered spaces above the upper deck under cover and open to the weather—that is, not inclosed.

SPECIAL PASSENGER ACCOMMODATIONS.

ART. 27. (a) No part of any vessel will be measured or registered for tonnage that is used for cabins or staterooms, and constructed entirely above the first deck which is not a deck to the hull (R. S., 4151). Such cabins and staterooms must be set apart exclusively for passengers; and when occupied by the officers or other members of the crew, wherever situated, they shall be included in gross and deducted therefrom in ascertaining the net tonnage.

(b) In the case of Army transports, colliers, supply ships, hospital ships, etc., the term "passengers" shall include all officers, enlisted men, and other persons who are not assigned to ship's duties and not entered on the ship's articles, and no deductions for spaces occupied by such persons shall be made, nor are cabins and staterooms occupied by them to be included in gross tonnage when situated on a deck not a deck to the hull.

DECK TO THE HULL.

ART. 28. The uppermost deck, extending from stem to stern, which has a direct bearing upon the frame timbers, or a portion of them, and also to which the hull extends continuously with none of the openings required in shelter deck spaces from stem to stern, even though lighter than other decks in the vessel, having its hatchways or other openings provided with means for closing them against the action of the sea and weather upon the space below inclosed by the sides of the vessel, and making the said space a fit place for the stowage of general cargo, like a hold, is the upper deck to the hull; that is, it is the uppermost continuous deck within the boundaries of the hull. Partial decks above this, even though supported by the frames of the vessel, are not to be regarded as decks to the hull.

RECORD OF EXCLUDED SPACES.

ART. 29. (a) The tonnage measurement of all spaces above the upper deck that the measurer has not included in the gross tonnage of the vessel should be given in detail on Catalogue 1410, "Tonnage admeasurement," which, if forwarded to the Bureau for test and examination, should be accompanied by any plans, sketches (drawn to scale), or explanation required for the proper consideration of the exemption of such spaces.

(b) Should there be no spaces above the upper deck which have been exempted this should be noted on Catalogue 1410, "Tonnage admeasurement."

(c) The measurer should be careful to record in the space provided on the above form the principal dimensions, tonnage, and position of all spaces above the upper deck that are not included in the cubical contents forming the ship's registered tonnage.

(d) All doubts arising in the minds of the measurers concerning decks to the hull, inclosures on or above the upper deck, shelter decks, and all other points, accompanied by sketches of the spaces and all the facts bearing on the same, should be submitted to the Commissioner of Navigation for his decision.

WESTERN RIVER STEAMERS.

ART. 30. (a) On side-wheel steamers of the western rivers the space between the "doctor" and the first stanchion aft is to be allowed for gangway. But if the first stanchion be more than 6 feet aft of the "doctor," then an allowance of 6 feet only is made for gangway. Allow also at the sides of the engine frame the width of the footboard of the engineer.

(b) On stern-wheel steamers of the western rivers make the same allowance for gangway aft the boilers as is made for gangway aft of the "doctor" on side-wheel steamers. The freight room is to be measured from the gangway aft to the "doctor."

(c) If any portion of the space aft of the "doctor" of stern-wheel steamers be available for cargo, stores, passengers, or crew, it also must be measured.

(d) Spaces having angular recesses in their sides—e. g., freight room—will be measured in parts.

MOTOR BOATS.

ART. 31. In motor boats, having the engine in a house used for other purposes, exempt so much of the space above deck as equals the product of length of the engine plus 2 feet by one-half the breadth of the boat at that part, by the height of said house.

OPEN VESSELS.

ART. 32. In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary line of measurement, and the depth shall be taken from an athwartship line extending from the upper edge of said strake at each division of the length.

NET TONNAGE—DEDUCTIONS FROM GROSS TONNAGE.

GENERAL RULE.

ART. 33. The deducted spaces when bounded by practically flat surfaces as ordinary crew spaces, etc., are to be measured by taking the product of the three dimensions, but when bounded by one or more curved surfaces they are to be measured according to the Moorsom system.

DEDUCTIONS.

From the gross tonnage of every vessel of the United States there shall be deducted—

CREW SPACES.

ART. 34. (a) The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. In spaces appropriated to the use of the crew may be included passageways serving exclusively such spaces, spaces reasonable in extent, necessary to shelter the cook when employed in the preparation of provisions, the engineer when employed in condensing water for the crew, the chief engineer's office used exclusively in official duties,

and the wireless operator when engaged in his work or where he may be berthed, water-closets or privies, messrooms and bathrooms or washrooms exclusively for the use of the officers and crew. But none of these spaces when used by or for the passengers are to be deducted.

PENALTY FOR OBSTRUCTING CREW SPACES.

NOTE.—Every place for berthing the crew shall be kept free from goods or stores not the personal property of the crew in use during the voyage, with the exceptions noted below, and, if any such place is not so kept free, the master shall forfeit and pay to each seaman or apprentice lodged therein the sum of 50 cents per day for each day during which any goods or stores as aforesaid are kept or stored therein after complaint has been made to him by any two or more of the seamen so lodged.

MARKING OF SPACES.

ART. 35. No deduction shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate, or purpose for which used, with these words, "Certified to accommodate — seamen," "Certified mess room," "Certified W. C.," etc.

DIMENSIONS AND REQUIREMENTS OF CREW SPACES.

NOTE A.—Every place appropriated to the crew of a seagoing vessel of the United States, except a fishing vessel, yacht, a pilot boat, and all vessels under 200 tons register, built prior to November 4, 1915, shall have a space of not less than 72 cubic feet and not less than 12 square feet measured on the deck or floor of that place for each seaman or apprentice lodged therein: *Provided*, That any such seagoing sailing vessel, built or rebuilt after June 30, 1898, and prior to November 4, 1915, shall have a space of not less than 100 cubic feet, and not less than 16 square feet measured on the deck or floor of that space for each seaman or apprentice lodged therein. Such place shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water: *Provided further*, That on all merchant vessels of the United States the construction of which shall be begun after November 4, 1915, except yachts, pilot boats, or vessels of less than 100 tons register, every place appropriated to the crew of the vessel shall have a space of not less than 120 cubic feet and not less than 16 square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

HOSPITAL SPACES.

NOTE B.—That in addition to the space allotment for lodgings hereinbefore provided on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of 12 or more seamen, there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every 12 seamen constituting her crew, provided that not more than six bunks shall be required in any case.

WASH ROOMS AND BATHROOMS.

NOTE C.—All merchant vessels of the United States, the construction of which shall be begun after November 4, 1915, having more than 10 men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed 10, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of washbasins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than \$50 nor more than \$500: *Provided,*

FUMIGATION.

NOTE D.—That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

NOTE E.—Fishing vessels, yachts, and pilot boats are specially exempted from the provision of section 1 of the act of March 2, 1895, and yachts, pilot boats, and vessels under 100 tons from the provisions of the act of March 4, 1915, so far as regards the amount of space which shall be appropriated to the crew, and from the provision that said space shall be kept free from goods or stores not the personal property of the crew in use during the voyage. (Act of Mar. 3, 1897.)

MISSISSIPPI RIVER STEAMBOATS.

NOTE F.—Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew which shall conform to the requirements of section 2 of the act of March 3, 1897, and section 2 of the act of March 4, 1915, so far as they shall be applicable thereto, by providing sleeping room in the engine room, properly protected from the cold, winds, and rain by means of suitable awnings or screens on either side of the guards, or sides, and forward, reaching from the boiler deck to the main or lower deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

MASTER'S CABIN.

ART. 36. Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space. This space includes sleeping room, dressing room, bathroom, office, and passageways serving the master's accommodations, but each such space shall be stated separately on the certificate of registry.

NAVIGATION SPACES, ETC.

ART. 37. Any space reasonable in extent used exclusively for the working of the helm, the capstan, and the anchor gear, when below deck, or for keeping the charts, signals, lamps, and other instruments of navigation and boatswain's stores and the words: "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

DONKEY ENGINE AND BOILER.

ART. 38. (a) The space occupied by the donkey engine and boiler, if situated within the boundary of the engine room or the casing above it, and if the said donkey engine is used in connection with the main machinery for propelling the vessel and forms part of the actual engine room, should not be the subject of a separate allowance.

(b) When the donkey boiler is in a house above the upper deck and not connected with the main machinery as described above, it is not subject to measurement in the gross tonnage of the ship and therefore must not form a deduction.

(c) In all other cases the space occupied by the donkey engine and boiler, if connected with the main pumps of the ship, is to be allowed as a deduction from the tonnage, if reasonable in extent, and properly and efficiently constructed. It must be marked as other deducted spaces, showing the use to which it is to be put.

STORAGE OF SAILS.

ART 39. In the case of a vessel propelled wholly by sails, any space, not exceeding two and one-half per cent of the gross tonnage, used exclusively for the storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent, properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

PROPELLING-POWER PERCENTAGES.

In the case of a vessel propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made as follows:

ART. 40. (a) In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above 20 per cent and under 30 per cent of the gross tonnage, the deduction shall be 37 per cent of the gross tonnage.

(b) In vessels propelled by screws in which the tonnage of the space is above 13 per cent and under 20 per cent of the gross tonnage, the deduction shall be 32 per cent of the gross tonnage.

(c) The shaft trunk space shall be deemed necessary for the proper working of the machinery and considered a part of the propelling-power space.

(d) In the case of vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to 20 per cent or under of the gross tonnage of the vessel, the deduction shall consist of one and one-half times the tonnage of the actual machinery space.

(e) In the case of screw vessels, when the machinery space is 13 per cent or less of gross tonnage, of one and three-fourths times the tonnage of the actual machinery space.

(f) But if the actual machinery space is so large as to amount in the case of paddle vessels to 30 per cent or above, and in the case of screw vessels to 20 per cent or above, of the gross tonnage of the vessel, the deduction shall consist of 37 per cent of the gross tonnage in the case of a paddle vessel and 32 per cent of the gross tonnage in the case of a screw vessel.

(g) Or, if the owner prefers, there shall be deducted from the gross tonnage of the vessel the tonnage of the space, or spaces, actually occupied by, or required to be inclosed for the proper working of the boilers and machinery, including the shaft trunk or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of 50 per cent, and in the case of vessels propelled by screws of 75 per cent of the tonnage of such space.

SPACES ABOVE CROWN OF ENGINE ROOM.

ART. 41. (a) On a request in writing to the Commissioner of Navigation by the owner of a vessel, the tonnage of such portion of the space, or spaces, above the crown of the engine room above the upper deck as is framed in for the machinery, or for the admission of light and air, and not required to be added to gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the engine space; but it shall then be included in the gross tonnage. Such space, or spaces, must be reasonable in extent, safe, and seaworthy and can not be used for any purpose other than the machinery, or for the admission of light and air to the machinery or boilers, of the vessel. To get this benefit, the request must be accompanied with a description and sketch, or tracing, of the spaces, the measurement thereof, and the collector's certificate that such space, or spaces, conform to the requirements stated above.

(b) In construing the words "reasonable in extent" the measurer should note that the length should not exceed the length of the propelling space, and if any portion is plated over, the length of the plated part should be deducted from the full length; and whatever the breadth of the casing may be, no greater breadth is to be allowed for the purpose of propelling space deduction than one-half the extreme inside breadth of the ship amidships.

MEASUREMENT OF ENGINE ROOM.

ART. 42. Notwithstanding the ratable allowance for propelling power for which the act of March 2, 1895, provides, the measurers

will observe that it will always be necessary to measure the engine room, whatever may be its size, in order to ascertain whether the allowance to be deducted for the propelling power is to be regulated by the general percentage prescribed by the act, or by the actual contents of the engine room ascertained by measurement.

SPACES INCLUDED IN ENGINE ROOM.

ART. 43. (a) By the space occupied by the engine room is to be understood that occupied by the engine room itself and the boiler room, together with the spaces strictly required for the working of the engines and boilers, and consists of the following items: (1) Space below the crown of the engine room, as defined below; (2) space between the crown and the upper deck framed in for the machinery, or for the admission of light and air; (3) space similarly framed in above the upper deck when permitted under paragraph (i), act of March 2, 1895; and (4) the contents of the shaft trunk or trunks in screw vessels.

(b) The crown or top of the main space of the actual engine room, from which the depth of the main space is to be taken, will either be at the under side of a deck or, if the side bulkheads are curved, at the point or height at which the curve terminates.

(c) In the case of engine rooms of irregular form, the space is to be measured in parts with a view to obtaining the correct cubic contents.

(d) As a rule, the length of the engine room extends from the bulkhead forward of the boilers to the one aft of the engines; but if these bulkheads limit a space too great for the proper working of the boilers and engines, then that length only is to be measured which is requisite for containing the boilers and machinery, with the addition, when the fire grates are in a fore-and-aft direction, of such length as is necessary for the stoking or working of the fires in a fore-and-aft direction clear of the machinery or forward bulkhead. The additional length on this account may be about 1 foot more than the length of the fire grates. In any case where it may appear to the measurer that a greater length should be allowed, he must submit all particulars, with plans, to the Commissioner of Navigation for consideration.

(e) No such additional length is, however, required when the boilers are placed with the fire grates athwartship, as in such a case the stoking or working of the fires in an athwartship direction does not interfere with the position of the engines or bulkhead. The clear central space allowed between the boilers, when the stoking is athwartship, should be sufficient for this purpose. The point to which the after boundary of the length of the engine room is to be measured should be no further aft of the after cylinder or of its valve casing than is necessary for safe working, which is about 4 feet aft of such cylinder or valve casing. When it appears to the measurer that a greater length should be allowed, he must apply for instructions.

(f) Between the engines and boilers the measurer should allow such length as may appear to him necessary for the safe working of the machinery.

(g) The engine space between the crown of the main engine room and the upper deck, if any, is to be measured separately and its cubical contents added to the main space.

SHAFT TRUNKS.

ART. 44. (a) When there is no built tunnel, the following rules should be observed in the case of a vessel with a single screw. The thrust-block space should be taken of such length and breadth as will admit of a man getting round it to remove the holding-down nut, and the height need not exceed 7 feet. The tunnel allowed should be of ordinary dimensions suitable for the vessel.

(b) When the vessel is a twin screw and the space aft of the engines is open from side to side, the space should not be included in the engine-room measurement for a greater height than 6 feet mean, and any space therein appropriated for stores or for any purpose other than the propelling power should be deducted from the space to be included in the engine room.

RULE FOR MEASUREMENT OF ENGINE SPACE.

ART. 45. (a) Measure the mean depth of the space from its crown to the ceiling at the limberstrake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of those measurements at each end, and another at the middle of the length; take the mean of those breadths; measure also the mean length of the space between the foremost and aftermost bulkheads, or limits of its length, excluding such parts, if any, as are not actually occupied by, or required for the proper working of, the machinery; multiply together these three dimensions of length, breadth, and depth, divide the product by 100 and the result shall be deemed the tonnage of the space below the crown; then find the cubical contents of the space or spaces, if any, above the crown aforesaid, which are framed in for the machinery, or for the admission of light and air, by multiplying together the length, depth, and breadth thereof; add such contents to the cubical contents of the space below the crown; divide the sum by 100; and the result shall (subject to the provisions hereinafter contained) be deemed to be the tonnage of the space.

(b) If, in any ship in which the space for propelling power is to be measured, the engines and boilers are fitted in separate compartments, the contents of each shall be measured severally in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the said space.

(c) In the case of screw steamers in which the space for propelling power is to be measured, the contents of the shaft trunk shall be ascertained by multiplying together the mean length, breadth, and depth of the trunk, and dividing the product by 100.

DEDUCTIONS FROM ENGINE ROOM.

ART. 46. The cubical contents of the engine space having been ascertained as described above, the cubical capacity of any cabins or storerooms which may be fitted in the engine room, and also any space occupied by machinery not used in propelling the ship, must be deducted, and the remainder being divided by 100 will be the net tonnage of the actual engine room.

SPECIAL RULE FOR DREDGERS.

ART. 47. The machinery spaces on the upper deck of dredgers towed from place to place on the Lakes, requiring to be documented, are to be exempted as in the case of other vessels, but no allowance for propelling power is to be made for such vessels on account of the machinery below deck that is used only for working the bucket, or scoop, and not for the propulsion of the vessel.

NET TONNAGE.

ART. 48. (a) The tonnage of a vessel remaining after the authorized deductions have been made shall be deemed to be the net, or register, tonnage.

(b) In ascertaining the net tonnage, no space is to be deducted unless it has previously been included in the gross tonnage.

(c) A register ton shall be 100 cubic feet.

MISCELLANEOUS.

FINAL RESULTS.

ART. 49. (a) Measurements and calculations based upon them must be made carefully and accurately. Calculations must be verified at least twice and a diagram of areas for half breadths made.

(b) The measurements and calculations being complete, and the tonnage duly marked on the main beam, the surveyor or measuring officer will certify the result to the collector, and such certificate form (Cat. 1322) will be preserved as a permanent record in the custom-house.

MARKING AND RECORDING OF TONNAGE.

ART. 50. (a) The net tonnage (omitting fractions), together with the official number, must be marked on the face of the beam under the forward side of the main hatch of seagoing vessels and lake vessels, and on the face of the beam under the after side of the starboard forward hatch of western river steamers. On river steamers of the coast which carry passengers both above and below main deck where there is no hatch to the main deck, the tonnage mark and official number should be made on one of the deck beams in a conspicuous place, and as near as possible to the middle of the vessel.

(b) It should be in plain Arabic numerals not less than 3 inches high and not less than three-eighths inch deep in vessels whose main beam is wood, and plainly cut or marked in oil paint, white when the beam is black, and black when the beam is of any light color, on vessels whose main beam is of steel or iron.

CHANGE OF TONNAGE.

ART. 51. The tonnage of any documented vessel of the United States expressed in her marine papers in pursuance of a measurement purporting to be in conformity to this rule can be changed or set aside only by the Commissioner of Navigation, so long as the vessel remains unchanged in form or burden. Applications for amendment or revision in such cases must be submitted to the Commissioner of Navigation with a precise statement of the errors supposed to exist.

APPENDIX.

ART. 52. (a) Upon the application of the owner, any vessel duly measured prior to April 1, 1895, may be remeasured in whole, or in part, to get the benefits of the deductions authorized under the act of March 2, 1895, and if a new register is not issued, the statement of such remeasurement shall be attached by an appendix (Cat. 1415) to the outstanding register or enrollment, with a certificate of the collector of customs that the original estimate of tonnage is amended pursuant to this act.

(b) The outstanding registers or enrollments of vessels of the United States shall not be rendered void by the addition of such new statement of her tonnage unless voluntarily surrendered, but the same may be added to the outstanding document or by an appendix thereto, with a certificate of a collector of customs that the original estimate of tonnage is amended.

(c) In the remeasurement of a steam vessel to bring it within the aforesaid provisions of the act of March 2, 1895, it will not be necessary to measure the space for propelling power. To get this space, take the deduction for propelling power given in the outstanding certificate and, if the vessel be a screw vessel, divide that deduction by 1.75; if a paddle vessel, divide by 1.50, and the result will be the actual spaces occupied by boilers and engines. These actual spaces may then be compared with the gross tonnage to ascertain the percentage of allowance for propelling power to which the vessel is entitled under the act of March 2, 1895. Actual measurement is to be avoided as far as possible, unless there is reason to believe the outstanding certificate of measurement is incorrect. The appendix granted should be inserted in the next papers issued.

(d) On the issue of appendix the collector will advise the Bureau of Navigation of the vessel's new net tonnage, and if the appendix issues otherwise than at the vessel's home port, he will also notify the collector at the home port.

APPENDIX FOR FOREIGN PORTS.

ART. 53. Upon application by the master or owner of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately for use in foreign ports the measurement of such space or spaces as are permitted to be exempted or deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States, and vice versa.

MEASUREMENT OF GOVERNMENT VESSELS.

ART. 54. The tonnage of Government colliers, transports, supply ships, repair ships, etc., shall be ascertained on request in accordance with these rules, but the following requirements will be waived: The marking of the ship's name and home port, official number (none required), and net tonnage; the requirements of size and conditions of crew space, and the certifications of deducted spaces on the beam over the doorway. The plate over the door designating its use is sufficient for such certifications.

FOREIGN VESSELS.

ART. 55. A similar mode of measurement having been adopted by Great Britain, Belgium, Denmark, Austria-Hungary, Germany, Italy, Sweden, Norway, Spain, the Netherlands, Russia, Finland, Portugal, Japan, and France, and the like courtesy having been extended to vessels of the United States, it is directed that merchant vessels of those countries, the registers of which indicate their gross and net tonnage under their present laws, shall be taken in the ports of the United States to be of the tonnage so expressed in their documents. Vessels of foreign countries, other than the aforesaid, are to be measured according to the laws of the United States.

MEASURING INSTRUMENTS.

ART. 56. (a) The measurements should be made with a waterproof tape, graduated into feet and tenths of a foot, and as nearly inelastic as possible. Chesterman's metallic tape is recommended.

(b) A pair of sliding rods or Moorsom's stanchion, or its equivalent, with a guide and a clamp or a set screw, so that they may be secured in a perpendicular position between the keelson and the deck, should be provided for showing the divisional points of the depths, marked thereon with white chalk or other material, to insure the taking of the breadths of the transverse sections at the proper intervals apart.

(c) A 2-foot rule, with a hinge joint, is required for taking the rake of the bow and stern, and for other purposes.

(d) A carpenter's square will be found useful for setting the sliding rod perpendicular to the keelson.

(e) For taking the breadths in the hold which are beyond the reach of the measuring officers, two rods will be needed, each 8 feet long, one having a slot or wheel at the top, through which the tape may be passed; and the other a hook, to which the ring at the end of the tape may be attached.

(f) For transferring the location of the stations or ordinates of the transverse sections from the deck to the keelson, and sometimes, for finding registered breadth, a plumb line and bob are needed.

(g) For measuring laden vessels for Panama or Suez Canal tonnage certificates, as provided for in the regulations, a girting galvanized chain of an approved make is required.

BLANKS.

ART. 57. The following blanks are to be furnished the measuring officers: Memorandum of dimensions, etc. (Cat. 1413); Tonnage admeasurements (Cat. 1410, 1410a, and 1410b); Record of tonnage admeasurement (Cat. 1411); Certificate of tonnage (Cat. 1412); Certificate of admeasurement (Cat. 1414); Admeasurement appendix to outstanding marine document (Cat. 1415); Statement of readmeasurement under act of March 2, 1895 (Cat. 1416); Inspector's certificate (Cat. 1322); Notice of assignment of official number and signal letters (Cat. 1321); Master carpenter's certificate (Cat. 1261a and 1261); and Application of owner for official number (Cat. 1320). The last two blanks to be given the builder and owner for execution.

PLANS AND DRAWINGS FOR MEASURERS.

ART. 58. (a) Builders or owners of steam vessels of over 100 gross tons approximately are requested, if practicable, in order to facilitate measurement, to furnish a reasonable time before the vessel is launched to the principal customs officer nearest to the place where the vessel is building, the following plans:

(1) A drawing of the cross section in which is shown the construction of the double bottom, if there be one; (2) an inboard view of the longitudinal section, showing the double bottom, its use or uses, if one, otherwise the floors, the compartments for water ballast, other than the double bottom, the decks, the superstructures, hatchways, etc.; (3) deck plans showing the arrangement and uses of different compartments and deductible spaces; (4) drawings showing the arrangement of the engine, boiler, and fuel compartments; and (5) a body plan showing half breadths of the sections at the points of division of the tonnage length of the vessel into a certain number of equal parts in accordance with the rules for the measurement of spaces under the tonnage deck. The scale or scales of these drawings are to be indicated thereon.

(b) The collector of customs is to be advised of any subsequent changes in the vessel and furnished copies of the corrected plans, or a statement of such changes.

(c) Builders or owners of smaller vessels will notify the principal customs officer nearest to the place where the vessel is building when the hold may be measured before cabins or other compartments are built in or the machinery installed. The measurers should be allowed access to such plans as will aid their work.

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Part II.—LAWS OF THE UNITED STATES RELATING TO THE MEASUREMENT OF VESSELS.

July 5, 1884.
Sec. 3.

The Commissioner of Navigation shall be charged with the supervision of the laws relating to the admeasurement of vessels, and the assigning of signal letters thereto, and of designating their official number; and on all questions of interpretation growing out of the execution of the laws relating to these subjects, and relating to the collection of tonnage tax, and to the refund of such tax when collected erroneously or illegally, his decision shall be final.

MEASUREMENT.

R. S., 4148.

Before any vessel shall be registered, she shall be measured by a surveyor, if there be one, or by the person he shall appoint, at the port or place where the vessel may be, and if there be none, by such person as the collector of the district within which she may be shall appoint. But in all cases where a vessel has before been registered as a vessel of the United States, it shall not be necessary to measure her anew, for the purpose of obtaining another register; unless such vessel has undergone some alteration as to her burden, subsequent to the time of her former registry.

R. S., 4149.

The officer or person by whom such measurement is made shall, for the information of and as a voucher to the officer by whom the registry is to be made, grant a certificate, specifying the build of the vessel, her number of decks and masts, her length, breadth, depth, the number of tons she measures, and such other particulars as are usually descriptive of the identity of a vessel, and that her name, and the place to which she belongs, are painted on her stern in manner required by this Title [R. S., 4131-4305]; which certificate shall be countersigned by an owner, or by the master of such vessel, or by some other person who shall attend her admeasurement, on behalf of her owner or owners, in testimony of the truth of the particulars therein contained; without which the certificate shall not be valid.

R. S., 4150.

The registry of every vessel shall express her length and breadth, together with her depth and the height under the third or spar deck, which shall be ascertained in the following manner: The tonnage deck, in vessels having three or more decks to the hull, shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage-deck. The length from the fore part of the outer planking on the side of the stem to the after part of the main stern-post of screw-steamers, and to the

after part of the rudder-post of all other vessels measured on the top of the tonnage-deck, shall be accounted the vessel's length. The breadth of the broadest part on the outside of the vessel shall be accounted the vessel's breadth of beam. A measure from the under side of the tonnage-deck plank, amidships, to the ceiling of the hold, (average thickness,) shall be accounted the depth of hold. If the vessel has a third deck, then the height from the top of the tonnage-deck plank to the under side of the upper-deck plank shall be accounted as the height under the spar-deck. All measurement to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

No part of any vessel shall be required by the preceding section to be measured or registered for tonnage that is used for cabins or state-rooms, and constructed entirely above the first deck, which is not a deck to the hull. R. S., 4151.

GROSS TONNAGE.

The register tonnage of every vessel built within the United States or owned by a citizen or citizens thereof shall be her entire internal cubical capacity in tons of one hundred cubic feet each, to be ascertained as follows: Measure the length of the vessel in a straight line along the upper side of the tonnage-deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern-timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern-timber in the thickness of the deck, and also what is due to the rake of the stern-timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the vessel belongs: R. S., 4153.

Class one. Vessels of which the tonnage length according to the above measurement is fifty feet or under: into six equal parts.

Class two. Vessels of which the tonnage length according to the above measurement is above fifty feet and not exceeding one hundred feet: into eight equal parts.

Class three. Vessels of which the tonnage length according to the above measurement is above one hundred feet, and not exceeding one hundred and fifty feet: into ten equal parts.

Class four. Vessels of which the tonnage length according to the above measurement is above one hundred and fifty feet, and not exceeding two hundred feet: into twelve equal parts.

Class five. Vessels of which the tonnage length according to the above measurement is above two hundred feet, and not exceeding two hundred and fifty feet: into fourteen equal parts.

Class six. Vessels of which the tonnage length according to the above measurement is above two hundred and fifty feet: into sixteen equal parts.

Then, the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor-timber, at the inside of the limber-strake, after deducting the average thickness of the ceiling, which is between the bilge-planks and limber-strake; then, if the depth at the midship division of the length do not exceed sixteen feet, divide each depth into four equal parts; then measure the inside horizontal breadth, at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breadth one, and so on down to the lowest breadth; multiply the second and fourth by four, and the third by two; add these products together, and to the sum add the first breadth and the last, or fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed sixteen feet, divide each depth into six equal parts, instead of four, and measure as before directed, the horizontal breadths at the five points of division, and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by four, and the third and fifth by two; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively one, two, three, and so forth, number one being at the extreme limit of the length at the bow, and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into six or sixteen parts, as in classes one and six, or any intermediate number, as in classes two, three, four, and five, multiply the second, and every even-numbered area by four, and the third, and every odd-numbered area, except the first and last, by two; add these products together, and to the sum add the

first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage-deck; divide this product by one hundred, and the quotient, being the tonnage under the tonnage-deck, shall be deemed to be the register tonnage of the vessel subject to the additions hereinafter mentioned.

DECK HOUSES, BREAKS, ETC.

If there be a break, a poop, or any other permanent closed-in space on the upper deck, available for cargo, or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained as follows and added to the gross tonnage: R. S., 4153.
Mar. 2, 1896.
Sec. 1 (h).

Measure the internal mean length of such space in feet, and divide it into an even number of equal parts of which the distance asunder shall be most nearly equal to those into which the length of the tonnage-deck has been divided; measure at the middle of its height the inside breadths; namely, one at each end and at each of the points of division, numbering them successively one, two, three, and so forth; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks, and multiply by it the mean horizontal area; divide the product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage-decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

HATCHWAYS.

The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of beam to the under side of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of one per cent of the gross tonnage and the remainder only shall be added to the gross tonnage of the ship exclusive of the tonnage of the hatchways. Feb. 6, 1909.

BETWEEN DECKS.

If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage-deck shall be ascertained as follows: R. S., 4153.

Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage-deck is divided; measure, also at the middle of its height, the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively one, two, three, and so forth, commencing at the stem; multiply the second, and all other even-numbered breadths, by four, and the third, and all the other odd-numbered breadths, except the first and last, by two; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two decks, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel ascertained as above directed. And if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage-deck, shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as above directed.

OPEN VESSELS.

R. S., 4153.

In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary-line of measurement, and the depth shall be taken from an athwartship line, extending from the upper edge of such strake at each division of the length.

WATER BALLAST.

Mar. 2, 1895.

In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall for the purposes of measurement be deemed to represent the floor timber. From the gross tonnage there shall be deducted any other space adapted only for water ballast certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel.

Feb. 6, 1909.
Sec. 2.

NET TONNAGE.

Aug. 5, 1882.

From the gross tonnage of every vessel of the United States there shall be deducted—

CREW ACCOMMODATIONS.

(a) The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. Every place appropriated to the crew of the vessel shall have a space of not less than seventy-two cubic feet and not less than twelve superficial feet, measured on the deck or floor of that place, for each seaman or apprentice lodged therein. The provisions of this Act requiring a crew space of seventy-two cubic feet per man shall apply only to vessels the construction of which shall be begun after June thirtieth, eighteen hundred and ninety-five. Such place shall be securely constructed, properly lighted, drained, and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from the effluvium of cargo or bilge water; and failure to comply with this provision shall subject the owner to a penalty of five hundred dollars. Every place so occupied shall be kept free from goods or stores of any kind not being the personal property of the crew in use during the voyage; and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged in that place the sum of fifty cents a day for each day during which any goods or stores as aforesaid are kept or stored in the place after complaint has been made to him by any two or more of the seamen so lodged. No deduction from tonnage as aforesaid shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate with these words, "certified to accommodate — seamen." Mar. 2, 1895.

That on all merchant vessels of the United States the construction of which shall be begun after the passage of this Act, except yachts, pilot boats, or vessels of less than one hundred tons register, every place appropriated to the crew of the vessel shall have a space of not less than one hundred and twenty cubic feet and not less than sixteen square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage. Mar. 4, 1915.
Sec. 6.

That in addition to the space allotment for lodgings hereinbefore provided, on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of twelve or more seamen,

there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every twelve seamen, constituting her crew, provided that not more than six bunks shall be required in any case.

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew, which shall conform to the requirements of this section, so far as they are applicable thereto, by providing sleeping room in the engine room of such steamboat, properly protected from the cold, wind, and rain by means of suitable awnings or screens on either side of the guards or sides and forward, reaching from the boiler deck to the lower or main deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

All merchant vessels of the United States, the construction of which shall be begun after the passage of this act having more than ten men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed ten, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of wash basins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than \$50 nor more than \$500: *Provided*, That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

DEDUCTIONS FOR OTHER PURPOSES.

Mar. 2, 1895.

(b) Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space.

(c) Any space used exclusively for the working of the helm, the capstan, and the anchor gear, or for keeping the charts, signals, and other instruments of navigation and boatswain's stores, and the words "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

(d) The space occupied by the donkey engine and boiler, if connected with the main pumps of the ship.

(e) In the case of a ship propelled wholly by sails any space, not exceeding two and one-half per centum of the gross tonnage, used exclusively for storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent and properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

DEDUCTIONS FOR PROPELLING POWER.

(f) In the case of a ship propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made, as follows: Mar. 2, 1895.

In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above twenty per centum and under thirty per centum of the gross tonnage, the deduction shall be thirty-seven per centum of the gross tonnage; and in ships propelled by screws in which the tonnage of the space is above thirteen per centum and under twenty per centum of the gross tonnage, the deduction shall be thirty-two per centum of the gross tonnage. In the case of screw steamers the contents of the trunk shaft shall be deemed spaces necessary for the proper working of the machinery.

(g) In the case of other vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to twenty per centum or under and in the case of screw vessels to thirteen per centum or under of the gross tonnage of the ship, the deduction shall consist in the case of paddle vessels of once and a half the tonnage of the actual machinery space and in the case of screw vessels of once and three-fourths the tonnage of the actual machinery space. But if the actual machinery space is so large as to amount in the case of paddle vessels to thirty per centum or above, and in the case of screw vessels to twenty per centum or above of the gross tonnage of the ship, the deduction shall consist of thirty-seven per centum of the gross tonnage of the ship in the case of a paddle vessel and thirty-two per centum of the gross tonnage in the case of a screw vessel; or if the owner prefers there shall be deducted from the gross tonnage of the vessel the tonnage of the space or spaces actually occupied by or required to be inclosed for the proper working of the boilers and machinery, including the trunk shaft or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of fifty per centum, and in the case of vessels propelled by screws of seventy-five per centum of the tonnage of such space.

(i) On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such

portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage; such space or spaces must be reasonable in extent, safe, and seaworthy, and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the ship.

REGISTER TONNAGE.

Aug. 5, 1882.

And the proper deduction from the gross tonnage having been made, the remainder shall be deemed the net or register tonnage of such vessels.

R. S., 4153.

The register of the vessel shall express the number of decks, the tonnage under the tonnage-deck, that of the between-decks, above the tonnage-deck; also that of the poop or other inclosed spaces above the deck, each separately.

Aug. 5, 1882.

The register or other official certificate of the tonnage or nationality of a vessel of the United States, in addition to what is now required by law to be expressed therein, shall state separately the deductions made from the gross tonnage, and shall also state the net or register tonnage of the vessel.

But the outstanding registers or enrollments of vessels of the United States shall not be rendered void by the addition of such new statement of her tonnage, unless voluntarily surrendered; but the same may be added to the outstanding document or by an appendix thereto, with a certificate of a collector of customs that the original estimate of tonnage is amended.

R. S., 4153.
June 19, 1886.
Sec. 5.

In every vessel documented as a vessel of the United States the number denoting her net tonnage shall be deeply carved or otherwise permanently marked on her main beam, and shall be so continued; and if the number at any time cease to be continued such vessel shall be subject to a fine of thirty dollars on every arrival in a port of the United States if she have not her tonnage number legally carved or permanently marked.

Mar. 2, 1895.
Sec. 4.
Feb. 14, 1903.
Sec. 10.
Aug. 5, 1882.
Sec. 3.

Under the direction of the Secretary of Commerce the Commissioner of Navigation shall make regulations needful to give effect to the provisions of this Act. The Secretary of Commerce shall establish and promulgate a proper scale of fees to be paid for the readmeasurement of the spaces to be deducted from the gross tonnage of a vessel, on the basis of the last sentence of section forty-one hundred and eighty-six of the Revised Statutes, beginning with the words "But the charge for the measurement."

APPENDIX OF MEASUREMENT.

Upon application by the owner or master of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately, for use in foreign ports, the measurement of such space or spaces as are permitted to be deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States.

Mar. 2, 1895.

Feb. 14, 1903.
Sec. 10.

This Act shall not be construed to require the remeasurement of any American vessel duly measured before April first, eighteen hundred and ninety-five; but upon application by the owner of any such vessel collectors of customs shall cause such vessel, or the spaces to be deducted, to be measured according to the provisions of this Act, and if a new register is not issued the statement of such remeasurement shall be attached by an appendix to the outstanding register or enrollment with a certificate of the collector of customs that the original estimate of tonnage is amended pursuant to this Act.

Mar. 2, 1895.
Sec. 2.

VESSELS EXEMPT FROM MEASUREMENT.

The provisions foregoing relating to the measurement of vessels shall not be deemed to apply to any vessel not required by law to be registered, or enrolled, or licensed, unless otherwise specially provided.

R. S., 4152.

MEASUREMENT OF FOREIGN VESSELS.

Whenever it is made to appear to the Secretary of Commerce that the rules concerning the measurement for tonnage of vessels of the United States have been substantially adopted by the government of any foreign country, he may direct that the vessels of such foreign country be deemed to be of the tonnage denoted in their certificates of register or other national papers, and thereupon it shall not be necessary for such vessels to be remeasured at any port in the United States; and when it shall be necessary to ascertain the tonnage of any vessel not a vessel of the United States, the said tonnage shall be ascertained in the manner provided by law for the measurement of vessels of the United States.

R. S., 4154.
Aug. 5, 1882.
Sec. 2.
Feb. 14, 1903.
Sec. 10.

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Part III.—PANAMA CANAL MEASUREMENT.

1. Customs officers authorized to measure vessels at ports of the United States are authorized by Article XVI of the proclamation of the President of the United States of November 21, 1913, "Rules for the measurement of vessels for the Panama Canal," to measure vessels according to Panama Canal rules for measurement and to issue Panama Canal tonnage certificates.

2. Customs officers may obtain Panama Canal rules for measurement and a supply of Panama Canal tonnage certificates from the "Chief of Office, the Panama Canal, Washington, D. C."

3. Questions of interpretation under Panama Canal measurement rules will be submitted in writing directly to the governor of the Panama Canal, Balboa Heights, Canal Zone. Decisions on such questions will be published and distributed to collectors of customs.

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Part IV.—SUEZ CANAL MEASUREMENT.

SUEZ CANAL MEASUREMENT RULES.

[Extract from the regulations for the measurement of tonnage, recommended by the International Tonnage Commission, assembled at Constantinople in 1873.]

GENERAL PRINCIPLES.

1. The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception), below the upper deck, as well as of all permanently covered and closed-in spaces on that deck.

N. B.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise, or for the berthing and accommodation of the passengers or of the officers and crew. Thus, any one or more openings, either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage, if they can be easily closed in after admeasurement, and thus better fitted for the transport of goods and passengers.

But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

2. "Deck loads" are not comprised in the measurement.

3. Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

4. The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

RULE I.—FOR MEASURING THE GROSS TONNAGE OF EMPTY VESSELS.

ARTICLE 1. The length for the measurement of ships having one or more decks is taken on the tonnage deck, which is—

(a) The upper deck for vessels having one or two decks.

(b) The second deck from below for vessels having more than two decks.

Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thick-

ness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the ship belongs.

ART. 2. *Class 1.*—Ships of which the tonnage deck is, according to the above measurement, 50 feet long or under, into 4 equal parts.

Class 2.—Ships of which the tonnage deck is, according to the above measurement, above 50 feet long and not exceeding 120 feet, into 6 equal parts.

Class 3.—Ships of which the tonnage deck is, according to the above measurement, above 120 feet long and not exceeding 180 feet, into 8 equal parts.

Class 4.—Ships of which the tonnage deck is, according to the above measurement, above 180 feet long and not exceeding 225 feet, into 10 equal parts.

Class 5.—Ships of which the tonnage deck is, according to the above measurement, above 225 feet long, into 12 equal parts.¹

ART. 3. Then, the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such ship to each point of division of the length as follows: Measure the depth at each point of division, from a point at a distance of one-third of the round of the beam below such deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling which is between the bilge planks and the limber strake. Then, if the depth at the midship division of the length does not exceed 16 feet, divide each depth into four equal parts; then measure the inside horizontal breadth at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement. Number these breadths from above—i. e., numbering the upper breadth 1, and so on down to the lowest breadth. Multiply the second and fourth by 4; and the third by 2; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four, and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above, as before; multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together, and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

ART. 4. The area of the transverse sections can also be measured with the same precision by the following method of polar coordinates:

Divide each transverse half section into five angular sectors, having the same angle at the apex (this angle is equal to $90/5$ of a degree = 18 degrees), and take for the area of each of these sectors

¹ A greater number of divisions is not prohibited so long as they are an even number.

the area of the sector of the circle comprised between its extreme radii, and described by the mean radius.

In making the measurement, measure the mean radius of each sector, of which the two extreme radii would make, the one with the horizontal line and the other with the vertical line, an angle of 9 degrees, while the others are uniformly 18 degrees apart.

In order to obtain their directions, place on the plane of the section a semicircle properly divided, and turned so that its horizontal diameter may pass through the third of the round of the beam, and that its center may be found in the central longitudinal vertical plane of the ship; the radii are to be measured by means of a tape fixed in the center of the semicircle.

In order to calculate the area of the section, square the mean radii thus measured, add them together, and the sum multiplied by 0.31416 shall be deemed to be the area of the section.

ART. 5. Number the transverse sections measured by one of these methods successively 1, 2, 3, etc., giving No. 1 to the extreme limit of the length at the bow, and the last number to the extreme limit of the length at the stern; then, whether the length be divided according to the table into 4 or 12 parts, as in classes 1 and 5, or any intermediate number, as in classes 2, 3, and 4, multiply the second and every even-numbered area by 4, and the third and every odd-numbered area (except the first and last) by 2; add these products together, and to the sum add the first and last, if they yield anything; multiply the quantity thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck. The tonnage of this volume is obtained by dividing it by 100, if the measurements are taken in English feet, and by 2.83 if the measurements are taken in meters.¹

ART. 6. If the ship has a third deck, commonly called a spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows: Measure in feet the inside length of the space at the middle of its height from the plank at the side of the stem to the lining on the timbers at the stern and divide the length into the same number of equal parts into which the length of the tonnage deck is divided, as above directed; measure (also at the middle of its height) the inside breadth of its space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively 1, 2, 3, etc., commencing at the stem; multiply the second and all the other even-numbered breadths by 4, and the third and all the other odd-numbered breadths (except the first and last) by 2; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths and the result will give in superficial feet the mean horizontal area of such space; measure the mean height of such space and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, or by 2.83 if the measurements are taken in meters, and the quotient shall be deemed to be the tonnage of such space and shall be added to the other tonnage of the ship ascertained as aforesaid; and if the ship has more than three decks the tonnage of each space

¹ In these rules the multiplier 0.353 may be used instead of the divisor 2.83 to give meters.

between decks above the tonnage deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforesaid.

ART. 7. If there be a break, poop, or any other permanent closed-in space on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew, the tonnage of such space shall be ascertained as follows: Measure the internal mean length of such space in feet and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height and multiply by it the mean horizontal area; divide the product by 100, or by 2.83 if the measurements are taken in meters, in order to obtain the tonnage of such space.

ART. 8. In measuring the length, breadth, and height of the general volume of the ship or that of the other spaces, reduce to the mean thickness the parts of the ceiling which exceed it. When the ceiling is wanting, or when it is not permanently fixed, the length and breadth are reckoned from the frame of the ship.

RULE II.—FOR MEASURING GROSS TONNAGE OF LADEN SHIPS.

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aftside of the sternpost, deducting therefrom the distance between the aftside of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it.

Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then, having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid, then multiply this product by the factor 0.17 in the case of ships built of wood, and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed-in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces and dividing the product by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotients so

obtained shall be deemed to be the tonnage of such space, and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

DEDUCTIONS ¹ TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE.

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net register tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to.

SAILING VESSELS.

ART. 12. For sailing vessels deduct the spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS.

ART. 14. For vessels propelled by steam or any other mechanical power, deduct—

1. The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage.

2. The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine rooms, and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

SHIPS HAVING COAL BUNKERS WITH MOVABLE PARTITIONS.

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms, and add to it, for

¹ Extract from the final report of the International Tonnage Commission assembled at Constantinople in 1873: "Sec. 17. It is recommended that a penal provision shall be enacted to the effect that if any of the permanent spaces which have been deducted shall be employed either for the use of merchandise or passengers, or in any way profitably employed for earning freight, that space shall be added to the net tonnage, and nevermore be allowed as a deduction."

screw steamers 75 per cent, and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner:

Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers.

Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown.

Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof.

Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

SHIPS WITH FIXED COAL BUNKERS.

ART. 17. In ships with fixed coal bunkers, measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or by 2.83 if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz:

- (a) The spaces framed in round the funnels.
- (b) The spaces required for the admission of light and air into the engine rooms.
- (c) The spaces, if any, necessary for the proper working of the engines.

ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions, as set forth in article 16, may be applied.

ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage; all the spaces occupied by machinery, boilers, and coal bunkers may be deducted. Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

ADDITIONAL DEDUCTIONS ALLOWED BY THE SUEZ CANAL CO.

The company allows the following spaces to be included in the deductions specified at article 12 of the regulations for the measurement of tonnage, provided the deductions do not, in the aggregate, exceed 5 per cent of the gross tonnage:

(a) The chart room, even when also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(b) The cabins of the ship's doctors, if actually occupied by them.

(c) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms, one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers. A mess room, if there is one, for the exclusive use of the petty officers. No deduction is allowed for the officers' mess room in ships having passenger accommodation, which are not also provided with a passengers' mess room.

(d) All spaces fitted as bathrooms or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as is available for passengers when no bathroom for their exclusive use is provided.

(e) All spaces specially provided for the storage of electric search-lights, the wireless-telegraphy installation, and the operator's berth, on condition that they are situated on the upper deck.

The above specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

MEASUREMENT OF DECK SPACES (SUPPLEMENTARY RULES OF 1904).

For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

SHIPS WITH ONE TIER OF SUPERSTRUCTURES ONLY.

1. *Poop, bridge, forecastle*.—The following exemptions are allowed:

(a) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(b) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(c) Such length of the forecastle measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(d) In each of the above three cases of superstructures, such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

2. *Poop and bridge combined, or forecastle and bridge combined*.—In each of these combined spaces the following exemptions are allowed:

(a) That length only which corresponds to the openings of the engine room and boiler spaces as specified in 1 (b), above.

(b) Such portions as are in way of openings not provided with any means of closing and corresponding to one another.

3. *Shelter decks*.—In the case of shelter decks the following exemptions are allowed:

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES.

(a) The exemptions prescribed in paragraphs 1, 2, and 3, above, are applicable in their entirety to the lower tier only.

(b) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

REMARK.

Should a ship at any time transit with merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

**MEMORANDUM BY THE UNIVERSAL MARITIME CANAL CO. OF SUEZ ON
THE APPLICATION OF THE RULES OF 1904 RELATIVE TO THE MEAS-
UREMENT OF SUPERSTRUCTURES.**

[Paris, 1909.]

A. DEFINITION OF THE VARIOUS SPACES ABOVE DECK.

In making out the special tonnage certificate of the Suez Canal, the superstructures to be considered are the following:

1. *Isolated spaces*.—Poop, bridge, and forecastle.
2. *Combined spaces*.—Extended poop and extended forecastle. If the poop and forecastle are united by a continuous roof or deck and by walls likewise continuous to the bridge, the spaces thus united constitute, according to definition, a combined space—extended poop in the first case, and extended forecastle in the second case. A complete break either in the roof or walls reverts the case to the category of isolated spaces.
3. *Shelter deck*.—The three spaces united into one constitute a shelter deck.

The superstructures may have a single tier or several tiers. The treatment applicable to the first tier is not the same as that applied to the others, and each tier is to be measured separately.

B. DETERMINATION OF THE DECK SPACES TO WHICH THE RULES OF 1904 APPLY.

Under the rules of 1904 for the determination of Suez tonnage, the spaces hereunder defined are divided into three categories:

First category.—Spaces or portions of spaces closed in according to national measurement rules.

These spaces are always included in Suez tonnage; the rules of 1904 are not applicable to them.

In determining whether or not a space is in this category the Suez Canal Co. accepts the judgment of the national surveyors. Since the rules adopted in the different countries for the determination of national tonnage are considered as practically identical, the treatment of a space is the same for Suez tonnage whatever may be the flag of the ship.

Second category.—Spaces or portions of spaces open according to Suez measurement rules and national measurement rules.

These spaces are not included in the special tonnage certificate of the Suez Canal Co.; the rules of 1904 are not applicable to them.

According to the rules of the commission of Constantinople, the spaces of the second category are: The spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

The Suez Canal Co. recognizes in the meantime that a space may be considered as open, and consequently excluded from tonnage, if there is an opening not provided with means of closing, the breadth of which is equal to or greater than half the breadth of the deck oppo-

site the opening, and if the space can not be used to shelter other merchandise than deck cargo.

In order to make this last restriction exact, the company recognizes that the space between the open face and a line drawn parallel to this face at a distance equal to half the width of the deck opposite the opening can not be used to shelter merchandise other than deck cargo, and that the remainder of the space may be used to shelter merchandise other than deck cargo and is not to be considered as open.

On the other hand, if in the interior of the superstructure, because of any arrangement whatever and at a distance from the open face less than one-half the width of the deck, the opening becomes less than one-half the width of the deck (above indicated), only that portion of the space comprised between the open face and this point is to be considered as belonging to the second category; the remainder of the space falls within the third category.

Furthermore, in order that a space may be considered as open beyond a distance equal to one-half the width of the deck it is necessary that it be actually isolated from the other superstructures. This condition is not to be considered as fulfilled unless the space is separated from the superstructure immediately adjacent by a break (interval) in the roof and in the walls equal to at least half the width of the deck; if the widths of the deck opposite the openings of two adjoining superstructures are different, the smaller width is to be taken.

Third category.—Spaces or portions of spaces open according to the national measurement rules, but which are closed in according to the Suez rules, because they do not fulfill the conditions defined above for the second category.

It is to these spaces that the rules of 1904 are applicable.

C. NATURE OF THE EXEMPTIONS PERMITTED BY THE RULES OF 1904.

The rules of 1904 define the portions of the spaces comprised in the third category that may be exempted.

In these definitions the length of the ship indicated is the total length comprised between the interior face of the stem and the interior face of the rear sternpost, the measurement being taken at the half height of the superstructures.

It is moreover to be understood, in everything that follows, that in no case shall the exemptions include closed-in spaces or portions of closed-in spaces situated within exemptable parts.

I. SHIPS WITH ONE TIER OF SUPERSTRUCTURES.

1. ISOLATED SPACES.

The exemptions permitted are as follows:

(a) *Poop.*—The portion of this space situated at the stern equal in length to one-tenth of the length of the ship measured from the interior face of the rear sternpost and at half the height of the poop.

(b) *Bridge.*—The portion of this space situated in way of the air spaces above the engine room and the boilers, it being understood that such air spaces are not considered to extend beyond the forward

bulkhead of the stokehold or the after bulkhead of the main engine room.

When the air spaces above the engine room and boilers are separated by an interval, the portion of the bridge in way of this interval is exempted.

The exemption of the portions of the bridge in way of air spaces has the effect of excluding the volume of these air spaces from the tonnage of the ship and therefore from the measurement of the engine room.

(c) *Forecastle*.—The portion of this space situated at the prow equal in length to one-eighth the length of the ship as measured from the interior face of the stem at half height of the forecastle.

(d) In each of these three types of superstructures, the parts situated exactly opposite the openings not provided with means of closing and corresponding to each other in the walls of the ship.

2. COMBINED SPACES.

(a) *Extended poop*.—The extended poop is subject to exemption in the same way as a bridge (portion in way of air funnels), but is not subject to the exemption of one-tenth as is an ordinary poop. The forecastle, separated from the extended poop, is granted the exemption of one-eighth.

It sometimes happens that in ships with isolated spaces the air funnels of the engine, instead of being situated in the bridge, are located in the poop. In this case the poop is treated the same as an extended poop and is in consequence measured; the bridge alone benefits from the exemption permitted in paragraph 1*d* above (parts opposite the openings in the walls of the ship). The forecastle is granted the exemption of one-eighth.

(b) *Extended forecastle*.—The extended forecastle is granted the exemption accorded to a bridge (portion situated in way of air funnels), but it is not granted the exemption of one-eighth as in case of an ordinary forecastle. The poop, isolated from the extended forecastle, is granted the exemption of one-tenth.

(c) In every combined space the portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the sides of the ship are exempted.

3. SHELTER DECK.

In the case of shelter decks, the following exemptions are allowed: The portions situated exactly opposite openings in the side plating of the ship not provided with means of closing and corresponding to each other in the opposite walls of the ship are exempted.

The air spaces situated within a shelter deck should be measured with the remainder of the volume of the engine room and deducted with the 75 per cent increment.

II. SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES.

(a) The lower tier alone is granted all the exemptions provided for in paragraphs 1, 2, and 3 above, for ships with a single tier of superstructures.

In order that the air spaces above the engine and boilers existing in the lower tier of spaces defined in paragraphs 1 and 2 above

(isolated spaces and combined spaces) may be comprised in the volume of space occupied by the machinery and then deducted with the 75 per cent increment, the shipowner must forego the exemption of the space situated in way of air spaces (see above (b), p. 51) and forego the exemption of open parts which may exist in the extremities of the space (see above, second category, p. 50), as well as the exemption of parts situated opposite openings corresponding to each other in the walls of the ship. (See above, 1 (d) and 2 (c).)

(b) The upper tiers may not benefit by the exemption of portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the walls of the ship.

The air spaces above the engine and boiler located in an upper tier may not be included in the volume of the engine and then be deducted with the 75 per cent increment, unless the shipowner foregoes the exemption of open parts which may exist in the extremities of the space (see above, second category, p. 50), and unless all the tiers below the tier under consideration are themselves measured the same as between decks.

(c) All the rules other than those which the company recognizes as in any category appertaining to a deck space (see above, pp. 50, 51) are equally applicable to all the tiers.

D. CONDITIONS FOR THE APPLICATION OF EXEMPTIONS PROVIDED FOR BY THE RULES OF 1904.

In order that the exemptions permitted may apply, there must be neither merchandise nor supplies of any kind in the portions of spaces which are entitled to benefit by exemption.

If a ship but a single time during her transit carries any merchandise of whatever nature, or coal for bunker purposes, or supplies in whatever amount, in any part of an exempted space, the entire space is added to the net tonnage and may never again be exempted.

INSTRUCTIONS TO AMERICAN CUSTOMS OFFICERS.

PRELIMINARY.

ARTICLE 1. (a) The transit dues of the Suez Canal are charged on the basis of the net tonnage ascertained in accordance with the system of measurement recommended by the international commission which assembled at Constantinople in 1873. Extracts from the report of the commission, including the regulations for tonnage measurement, are printed on pages 42-49.

(b) Special Suez tonnage certificates will be issued on application by collectors of customs to American ship owners requiring them for ships which will use the Suez Canal.

(c) Blank Suez Canal tonnage certificates on application will be supplied by the Bureau of Navigation, Department of Commerce, Washington, D. C., to customs officers requiring them.

(d) The certificate signed by the Commissioner of Navigation, when properly filled in, signed, dated, and sealed by the collector of customs, will be given to the master or owner for the use of the ship.

(1) A duplicate, complete except as to the signature of the Commissioner of Navigation, will be retained in the files of the collector of customs issuing the certificate.

(2) On the issue of a certificate the collector of customs will transmit to the Commissioner of Navigation a memorandum, giving the name of the ship, official number, port of registry, gross and net tonnage according to her American certificate, also the date of issue of the special Suez certificate with the gross and net Suez tonnage.

GROSS TONNAGE.

ART. 2. (a) For the purpose of the special Suez certificate the measurer will include in the gross measurement the entire cubic contents of the ship under the uppermost deck, except the space (if any) between the inner and outer plating (upon whatever system constructed) known as a double bottom for water ballast, which can be certified as not available for the carriage of cargo, stores, or fuel. The deep water-ballast tanks known as fore or after peak tanks are to be included in tonnage measurement.

(b) In the case of vessels which have already been measured for American tonnage it will not be necessary to remeasure the tonnage under the uppermost deck unless the measurer finds that some space has formerly been exempted that must, under the Suez Canal rules, be included, or vice versa, or unless the American underdeck tonnage is measured under the modified regulation on page 12.

SPACES ABOVE DECK.

ART. 3. For the purpose of the special certificates the measurer must also include in the gross tonnage the entire cubic contents of every covered and closed-in space above the uppermost deck, and with regard to such spaces he should be guided by paragraph 1 of the Suez regulations, page 42, and by the instructions contained in articles 4 and 5 below, which relate only to spaces entitled to exemption from United States tonnage measurement.

Spaces covered only by planks separated from one another by intervals exceeding 1 inch in breadth are not to be included in the gross tonnage.

OPEN SPACES.

ART. 4. (a) If the permanent opening measured at the end of the erection (forecastle, bridge space, or poop) is equal to or greater than one-half the breadth of the deck in way of it, and is not fitted with a coaming, the portion of the erection measured from the open end, and not exceeding in length such half breadth, is (subject to the following paragraph) to be regarded as an "open space" and described as such on the back of the Suez Canal certificate. When, however, a coaming is fitted to such an opening the space within it is to be included in the gross tonnage in every case, and only the exemptions provided for in article 5, are to be allowed.

(b) If in the interior of an erection, in consequence of any arrangement whatever, and at a distance from the open end less than half the breadth of the deck as above defined, the opening is at this point less than the said half breadth, only the length of the space between that point and the open end of the erection is to be regarded as an "open space" and described as such on the back of the Suez Canal certificate.

(c) The above instructions respecting "open spaces" apply to deck erections extending from side to side, whether situated in the lowest or any other tier, but in all cases where the openings in these erections are less than the half breadth of the deck in way of them they are to be measured in the gross tonnage and only the exemptions provided for in article 5 are to be allowed. When, however, two side-to-side erections are separated by an interval the length of which is less than the least half breadth of the deck in way of such interval, then, whatever be the breadth of the permanent openings, the erections less the interval are to be measured in the gross tonnage, and only the exemptions provided for in article 5 are to be allowed.

EXEMPTED SPACES.

ART. 5. In the case of shelter-deck spaces with one or more openings in the shelter deck and sides of the vessel the whole of the space under the shelter deck should be included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if any) in the sides of the ship.

(a) In all cases where a vessel is fitted with forecastle, bridge space, and poop there shall be exempted from measurement (1) such length of the forecastle measured from the inside of the stern at half height of the said forecastle as shall be equal to one-eighth of the full length of the ship; (2) such length of the poop measured from the inside of the stern timber at half height of the said poop as shall be equal to one-tenth of the full length of the ship; (3) such length of the bridge as is equal to the length of the actual deck openings to engine and boiler spaces, it being understood that such openings shall not be considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(b) In all cases where the poop and bridge, or forecastle and bridge, are combined and continuous, then only that length in each case which is due to the openings of engine and boiler spaces as defined under paragraph (a), (3), above shall be exempted from measurement.

(c) From the side-to-side erections referred to in the foregoing paragraphs (a) and (b) further exemptions may also be allowed for the portions of the spaces abreast of the permanent openings (if any) in the side plating, and also for the "open spaces" referred to in article 4 above.

(d) When the engines are aft and the light and air casings are situated in an ordinary poop the space is to be dealt with as for a combined poop and bridge, but the bridge space is to benefit only by the exemption of the portion abreast the permanent openings (if any) in the side plating or "open spaces" at the ends.

(e) By "full length of the ship" shall be understood, in all cases, such length as is comprised between the inside of stem at half height of the forecastle to the inside of the stern timber at half height of the poop.

(f) The exemptions provided for in paragraphs (a) and (b) above apply, in their entirety, only to deck erections situated in the lowest tier; the only exemptions to be made in side-to-side erections situated above this tier, and besides the "open spaces" (if any), are those portions immediately abreast of any permanent openings which may exist in the side plating.

• (g) In the case of shelter-deck spaces, the exemptions provided for may be allowed on the written request of the owners, either in the shelter-deck space, as provided for in article 5 above, or in the erections on the shelter deck as provided for in paragraphs (a) and (b), but in no case are exemptions to be allowed under article 5 in addition to exemptions under paragraphs (a) and (b).

LIGHT AND AIR CASINGS OVER ENGINES AND BOILERS.

ART. 6. The engine and boiler casings in the shelter-deck spaces are to be included in the gross tonnage and in the engine-room measurement, even if situated in part within an otherwise exempted space abreast permanent side openings.

In the case of side-to-side erections above the lowest tier the light and air casings may be included in the gross tonnage and actual engine room, provided the owner makes a written application for same, and also on condition that the side-to-side spaces beneath it have been similarly treated. When, however, the spaces are so dealt with no exemption is to be made from such spaces for any other portion whatever, either in the tier in question or in those beneath it.

Subject to the foregoing the light and air casings in all erections above the first tier are to be exempted from measurement.

MARKING OF EXEMPTED SPACES.

ART. 7. All exempted spaces must be permanently and conspicuously marked by a plate securely fixed to each side of the vessel to indicate the limits and length allowed, corresponding with the particulars shown upon the back of the Suez Canal certificate; the center of such plates should be marked thus and the inscription upon them should be as follows:

This space feet length from the inside of
 the { stem
or
stern timber } at the half height of the space
 to this mark is exempted from Suez Canal tonnage
 upon the ground that no cargo or stores are carried
 therein.

ACCESS.

ART. 8. The measurers must see that some satisfactory means are provided either by manhole or hatchway for gaining access to the exempted parts, in the event of the parts adjacent being filled with cargo. It would be well in all cases for the manhole or other opening to terminate at the point to which the exempted space extends.

PENALTY FOR CARGO IN EXEMPTED SPACES.

ART. 9. The regulations of the Suez Canal Co. provide that if at any time a vessel shall perform transit with cargo or stores carried in any portion of any exempted space, then the whole of that space shall be added to the net tonnage and can only be again exempted from measurement after a bona fide change in the ownership of the vessel.

NET TONNAGE.

ALLOWANCE FOR PROPELLING POWER.

ART. 10. Having ascertained the gross tonnage in the manner described above, the measurer will then proceed to measure the engine room, boiler space, and shaft trunk as for a certificate of American registry, and note in the proper place in the measurement form and on the certificate the cubic contents of each.

In cases where the owners elect not to use the "Danube rule"¹ but to have the actual bunker space as well as the actual engine space measured and deducted, the measurer will measure separately the bunkers, and record the cubic capacity of each in the proper place in the measurement form. In doing this he is not to include any bunkers that are not absolutely permanent, or from which the coals can not be directly trimmed into the engine room or stokehold, or into which any access can be obtained otherwise than through the ordinary coal chutes on deck and from the doors opening into the engine room or stokehold. He is to be specially careful that thwart-ship bunkers which can be in any way extended are not included in the measurements for deductions.

In no case, except in the case of tugs, is the engine-room allowance to exceed 50 per cent of the gross tonnage of the ship.

CREW-SPACE DEDUCTIONS.

ART. 11. In measuring the deductions for crew space the measurer will be careful to ascertain the cubic contents of each space as at present, but he must bear in mind that no deduction is to be made for the accommodation of the captain, purser, clerk, etc., or for the berths of stewards, cooks, in passenger steamers, or passengers' servants. Passages exclusively for access to deducted crew spaces may themselves be included in the deductions.

The following special deductions in respect of accommodation spaces are allowed:

(a) Doctors' cabins, if actually occupied by the doctors.

(b) All spaces fitted as bathrooms, or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(c) A mess room, if there is any, for the exclusive use of the officers; a second mess room, if there is any, for the exclusive use of the engineers; and a third mess room, if there is any, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess room in ships having passenger accommodation, which are not also provided with a passengers' mess room.

No deduction is to be allowed for crew space or for officers' cabins unless the regulations as to lighting, seaworthiness, ventilation, etc.,

¹ If the ship has not permanent bunkers, or if she has only lateral bunkers, and her coal is stowed in bunkers shut off from the hold by movable partitions, then the spaces of these lateral and temporary bunkers are not to be measured. In this case the rule to be applied is that in force on the Danube, namely, an allowance is made for the coal space by giving 50 per cent of the space occupied by the engine in a paddle-wheel steamer and 75 per cent in a screw steamer.

are complied with, nor unless the words "Certified to accommodate — seamen," "Certified to accommodate — officer or — officers," as the case may be, are cut in or painted on or over the doorway of each deducted space.

All water-closets having been included in the first place in the gross tonnage, those that are to be included in the deduction from tonnage are to have the words "Certified for the use of — crew" cut in or painted on or over the door.

In the case of passenger steamers on which there is only one galley, neither the galley nor the space occupied by the cook should be included in the deductions from the gross tonnage.

When there are two or more galleys, however, the space occupied by the galley or galleys exclusively used for the crew should be included in the deductions, and the words "Certified for the use of the crew" should be cut in or painted on or over each doorway of the space.

NAVIGATION-SPACE DEDUCTIONS.

ART. 12. Articles 12 and 14 of the Suez Canal Co.'s regulations allow the deduction of any covered and closed-in spaces on the upper deck used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation. Under this rule the wheelhouse, chart room, winch house, lookout house, signal house, steam-steering house, and the spaces provided for the storage of electric searchlights and wireless-telegraphy appliances on the upper deck are to be deducted from the gross tonnage, in which, however, they are in every case first to be included.

The chart room may be deducted, even if it is also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but, in all cases, the room used as a chart room must, if it is to be deducted, be situated on the upper deck.

When the donkey boiler in a closed-in space on the upper deck is not exclusively used for the working of the helm, the capstan, and anchor gear, or any of them, but is also available for hoisting the cargo, the space is not to be included in the deductions from the gross tonnage.

This instruction does not apply to the donkey-boiler house on the upper deck of men-of-war and troop ships.

MARKING OF DEDUCTED SPACES.

ART. 13. In granting deduction for the chart house, winch house, and wheelhouse, or any other covered and closed-in space on the uppermost deck used for navigating the ship, the measurer must see that the words "Certified for use in navigating the ship" are cut in or painted on or over the doorway of the space, and in like manner all spaces deducted from the gross tonnage are to have cut over them or painted on them a notice stating the purpose for which they are certified.

GENERAL.

ART. 14. In no case is any space to be deducted from the tonnage that is not first included in the gross tonnage, and in no case is the sum total of the deductions (other than the allowance for propelling power) to exceed 5 per cent of the gross tonnage of the ship.

No deduction is to be made for passenger accommodation, captain's or passengers' water-closets or lavatories, etc., passengers' cooking houses, or baggage storerooms, or for any other purpose than those indicated above.

It may happen that there are in certain ships some awnings or other constructions used merely for shelter (see second part of note to paragraph 1, Suez Canal Co.'s regulations), the space under which is not to be included in the gross tonnage, and is therefore not to be deducted afterwards. When this is so, the measurer should make a careful note of the particulars in the proper place in the forms.

When the collector is in any doubt whether any space should be exempted or deducted, he should apply for instructions to the Commissioner of Navigation.

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Part V.—MEASUREMENT OF UNITED STATES NAVAL VESSELS FOR THE SUEZ CANAL.

INSTRUCTIONS AND REGULATIONS.

[Compiled and prepared by the scientific and computing branch of the Bureau of Construction and Repair, Department of the Navy, 1909.]

GENERAL INSTRUCTIONS.

1. **UNIFORMITY IN MEASUREMENTS.**—These instructions are compiled for use in the preparation of tonnage certificates, upon which tonnage tolls may be collected, when ships of the United States Navy have occasion to pass through the Suez Maritime Canal, and it is of great importance not only that the following laws and regulations be followed, but that all the required measurements be taken, and calculations made, in one uniform and correct manner, so that one general system may prevail throughout.

2. **FEATURES NOT COVERED BY REGULATIONS.**—Whenever, in any calculation, new features arise, which are not clearly covered by these rules, instructions, etc., causing doubt as to method of procedure, the discussion thereof shall be referred to an officer of the bureau and his decisions relative thereto shall be appended to and made a part of these instructions, after reference to and approval by the chief constructor, if deemed necessary.

3. **PREPARATION OF CERTIFICATES.**—Suez Canal certificates of tonnage shall be prepared in full detail from careful calculations made in accordance with the following statutes, regulations, and instructions, and special care shall be exercised in their preparation in order that no incomplete or obscure entries shall appear in a certificate, which might constitute ground for investigation or possible remeasurement on the part of the canal authorities.

4. **RECORD OF CERTIFICATES.**—A full and careful record shall be entered in a book to be known as the tonnage book and in the general form of the certificate of the results of any and all tonnage calculations which may be made; also the drawings and figures made in connection with the preparation of any certificate shall be preserved in the files of the scientific and computing branch of the Bureau of Construction and Repair.

5. **USE OF RULE FOR LADEN SHIPS.**—In general calculations, measurements will be taken in the manner prescribed for unladen ships, whenever possible, but when, due to the absence of plans and records or to special hardships or difficulties, that method is rendered impracticable, the rule for laden ships may be employed. This condition will probably seldom arise, but the exception is inserted to cover a possible case.

6. **REMEASUREMENT UNDER RULE FOR UNLADEN SHIPS.**—Any ship which may have, of necessity, been measured while laden, shall, at the earliest practicable time thereafter, be measured in the usual

manner, and the results thus obtained shall supersede such previous calculation.

7. SHIPS PREVIOUSLY UNDER FOREIGN FLAGS.—Whenever it becomes necessary to provide a Suez Canal certificate for any vessel which may have been previously registered under a foreign flag, and have had a foreign certificate issued to her prior to becoming the property of the United States, a new calculation shall be made in accordance with these instructions, and a new certificate shall be issued, which shall constitute the correct Suez tonnage for that vessel.

8. ALTERATION OF CERTIFICATES DUE TO CHANGES.—If after a certificate has been issued to any naval ship it becomes necessary to change or alter her by the addition or removal of any space which will affect the tonnage, such spaces shall be measured and a new certificate issued, which shall represent the correct tonnage of the ship after the addition or deduction shall have been made.

9. USE OF FIGURES FROM A PREVIOUS CALCULATION.—When in preparing the Suez certificate any vessel's national certificate of registry is available, it will not be always necessary to remeasure the tonnage under the uppermost deck, unless it is found that some space has been exempted in such certificate of registry that must, under these rules, be included, or vice versa, provided the certificate has been issued by a country which had previously adopted a system of tonnage measurement similar in its essential features to the system herein below.

10. DESIRABILITY OF RETAINING ORIGINAL FIGURES.—Whenever changes in a ship's arrangement necessitate alterations in a certificate, it is to be understood that it is desirable that the original figures for below and between deck spaces be retained, if possible; therefore no new figures will be made for such spaces unless directly affected by the changes in the ship, as the small differences, due to a new calculation, are of minor consequence and are to be avoided.

11. MEASUREMENTS FROM PLANS.—Measurements taken from finished plans of any naval vessel, corrected to cover the latest arrangements affecting tonnage spaces, shall be considered to be as accurate and useful in the calculation of tonnage as dimensions lifted directly from the ship, inasmuch as these plans are taken from work under the direction of a representative of the Bureau of Construction and Repair.

12. SISTER SHIPS.—In determining the tonnage of sister ships, actually built from the same lines and molds and having nearly similar arrangements, it will be necessary to calculate the similar portions in the case of one ship only; the results shall then be considered to apply equally well to any of such ships.

13. SPACES REASONABLE IN EXTENT.—In vessels of the Navy all spaces as constructed or as altered shall be considered as being reasonable in extent, since it is clearly disadvantageous to the Navy to evade any tonnage dues at the expense of maximum efficiency of general arrangement of a ship's compartments.

14. CERTIFICATION OF SPACES.—All spaces on vessels of the Navy shall be considered as having been properly certified, since it is usual on naval ships to clearly designate the use of a compartment by a name plate over the doorway or opening thereto.

15. FULFILLMENT OF REQUIREMENTS.—The requirements for lighting, ventilation, and seaworthiness shall be considered as having been

fulfilled in all spaces on United States naval vessels, whether assigned to officers, crew, machinery, for the passage of light and air, or for any other purpose.

16. **ACCURACY OF MEASUREMENTS.**—All general measurements will be sufficiently accurate if carried to the nearest hundredth of a foot.

17. **DEVIATION FROM METHOD.**—Although the rules and regulations as hereinafter laid down will, in general, fully cover the measurement of ships of various forms and diversified construction, it must be borne in mind that in order to obtain a correct result when the prescribed method is inadequate, in detail, the geometrical formula best adapted to the results to be obtained shall be utilized.

18. **EXEMPTED SPACES.**—Should there be any spaces exempted in figuring the tonnage of a ship, such spaces should be enumerated on the certificate, and when no spaces are exempt that fact should be noted.

19. **TO REDUCE TONS TO CUBIC METERS.**—In order to change tons of 100 cubic feet each to cubic meters multiply by the factor 2.83.

GROSS TONNAGE.

In obtaining the gross tonnage of any United States naval ship the rules for measurement of ships of American register shall prevail (see Revised Statutes of the United States Nos. 4150, 4153, etc.), with such modifications as may be made necessary by the "Regulations for the Navigation of the Suez Maritime Canal."

1. **DEFINITION OF GROSS TONNAGE.**—The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception) below the upper deck, as well as of all permanently covered or closed-in spaces on that deck.

2. **DEFINITION OF COVERED OR CLOSED-IN SPACES.**—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise or for the berthing and accommodation of the passengers, or of the officers and crew. Thus, any one or more openings either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage if they can be easily closed in after admeasurement and thus better fitted for the transport of goods and passengers. But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads." "Deck loads" are not comprised in the measurement.

3. **SHELTER DECKS.**—In the case of shelter-deck spaces the whole of the space under the shelter deck is included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if there are any) in the sides of the ship.

4. **DEFINITION OF TONNAGE DECK.**—The tonnage deck in vessels having three or more decks to the hull shall be the second deck from

below; in all other cases the upper deck of the hull is to be the tonnage deck:

5. MEASUREMENTS.—All measurements to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

6. METHOD OF MEASURING UNLADEN SHIPS (RULE I).—The register tonnage of every vessel built within the United States, or owned by a citizen or citizens thereof, shall be her entire internal cubical capacity in tons of 100 cubic feet each, to be ascertained as follows:

Below tonnage deck.—Measure the length of the vessel in a straight line along the upper side of the tonnage deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table; according to the class in such table to which the vessel belongs.

The classes shall be arranged as follows:

Class 1. Vessels of which the tonnage length, according to the above measurements, is 50 feet or under—into 6 equal parts.

Class 2. Vessels of which the tonnage length, according to the above measurements, is above 50 feet and not exceeding 100 feet—into 8 equal parts.

Class 3. Vessels of which the tonnage length, according to the above measurements, is above 100 feet and not exceeding 150 feet—into 10 equal parts.

Class 4. Vessels of which the tonnage length, according to the above measurements, is 150 feet and not exceeding 200 feet—into 12 equal parts.

Class 5. Vessels of which the tonnage length, according to the above measurements, is above 200 feet and not exceeding 250 feet—into 14 equal parts.

Class 6. Vessels of which the tonnage length, according to the above measurements, is above 250 feet—into 16 equal parts.

Then the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length, as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling, which is between the bilge planks and limber strake; then if the depth at the midship division of the length does not exceed 16 feet divide each depth into 4 equal parts; then measure the inside horizontal breadth at each of the three points of division and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breadth 1, and so on down to the lowest breadth; multiply the second and fourth by 4 and the third by 2; add these products together, and to the sum add the first breadth and the last, or fifth; multiply the

quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet divide each depth into 6 equal parts instead of 4 and measure as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by 4 and the third and fifth by 2; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively one, two, three, etc., number one being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into 6 or 16 parts, as in classes 1 and 6 or any intermediate number, as in classes 2, 3, 4, and 5, multiply the second and every even-numbered area by 4, and the third, and every odd-numbered area, except the first and the last, by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck; divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed the register tonnage of the vessel, subject to the additions hereinafter mentioned.

Inner bottom.—In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall, for the purposes of measurement, be deemed to represent the floor timber.

Between decks.—If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

Measure, in feet, the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage deck is divided; measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively one, two, three, etc., commencing at the stem; multiply the second, and all other even-numbered breadths by 4 and the third and all the other odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100

and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel, ascertained as above directed. And if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage decks, shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as above directed.

Deck houses, breaks, etc.—If there be a break, a poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained and added to the gross tonnage.

Measure the internal mean length of such space in feet and divide it into an even number of equal parts, of which the distance asunder shall be most nearly equal to those into which the length of the tonnage deck has been divided; measure at the middle of its height the inside breadths, namely, one at each end and at each of the points of division, numbering them successively one, two, three, etc.; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks and multiply by it the mean horizontal area; divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

7. OPEN VESSELS.—Open vessels are not comprised within the proposed international rules of measurement.—Report of the International Tonnage Commission, assembled at Constantinople in 1873, section 16.

8. METHOD OF MEASURING LADEN SHIPS (RULE II.)—In order to enable those who may be charged with the calculation of tonnage of ships of the United States Navy to properly interpret such figures as may appear in any certificate prepared by the Suez authorities themselves, it may be well to quote the method followed in the measurement of laden ships which have no certificate to accompany an application for passage through the canal.

The deductions from the gross are the same as those appearing under the heading "Net tonnage," but the total capacity or gross figure is arrived at as follows:

RULE II.—FOR LADEN SHIPS.

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aft side of the sternpost, deducting therefrom the distance between the aft side of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it.

Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girth the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid; then multiply this product by the factor 0.17 in the case of ships built of wood, and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces, and dividing the products by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotients so obtained shall be deemed to the tonnage of such spaces, and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

9. HATCHES.—The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together, and the product by the mean depth taken from the top of beam to the under-side of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage, and the remainder only shall be added to the gross tonnage of the ship, exclusive of the tonnage of the hatchways.

10. LIGHT AND AIR SPACES TO MACHINERY.—On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to the gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage. Such space or spaces must be reasonable in extent, safe, and seaworthy, and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery, or for the admission of light and air to the machinery or boilers of the ship.

11. EXEMPTIONS.—For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

I. SHIPS WITH ONE TIER OF SUPERSTRUCTURES ONLY.

(1) *Poop, bridge, forecastle.*—The following exemptions are allowed:

(a) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(b) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(c) Such length of the forecastle, measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(d) In each of the above three cases of superstructures, such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

(2) *Poop and bridge combined, or forecastle and bridge combined.*—In each of these combined spaces, the following exemptions are allowed:

(a) That length only which corresponds to the openings of the engine room and boiler spaces as specified in (b) above.

(b) Such portions as are in way of openings not provided with any means of closing and corresponding to one another.

(3) *Shelter decks.*—In the case of shelter decks, the following exemptions are allowed:

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

II. SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES.

(a) The exemptions prescribed in paragraphs (1), (2), and (3) above are applicable in their entirety to the lower tier only.

(b) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

12. *USE OF EXEMPTED SPACES.*—Should a ship, at any time, transit with merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

INSTRUCTIONS AND DEFINITIONS AS TO GROSS TONNAGE.

1. *DECKS NOT CONSIDERED CONTINUOUS.*—In deciding which deck fulfills the requirements for a tonnage deck, neither the platform decks when composed of several flats nor the armored protective deck when such protective deck merges into and forms only a portion of another deck shall be considered a complete deck, within the interpretation of the meaning of the law.

2. *BREAK DECKS, IN TWO-DECKED SHIPS.*—If the second deck from the keel, in a two-decked vessel, consists of several partial decks, extending, with breaks, from the stem to the stern, the line of that course of decks must be taken as the tonnage deck; and if the partial decks are at different heights, the line of the lowest flat will be taken as the tonnage deck, and the headroom above such line and under the higher flats will be measured and added as inclosures above decks.

3. *BREAKS—DEFINITION OF.*—A break is the space above the line of the deck when that deck is cut off and continued at a higher elevation. The height of a break is the distance from the underside of the deck cut off to the underside of the break deck.

4. *BREAKS IN INNER BOTTOM.*—When it is necessary to establish the below-deck volume of a vessel with an irregular or broken inner

bottom, the length of the ship should be divided into sections, of lengths, equal to the unbroken portions of the inner bottom lines, and after subdividing each of such sections into parts, according to the class under which the sections respectively belong, the volume of each should be calculated separately, in such manner as to determine, as exactly as possible, the volume of the hold. Where lengths of sections are 30 feet or under, they may be divided into two equal parts. When the underdeck tonnage is measured in parts in consequence of a break or breaks in the double bottom, the tonnage depth at the middle of the tonnage length will determine the number of parts into which the remaining depths are to be divided.

5. **SPRING OF BEAM.**—The round or spring of the beam is the perpendicular distance from the crown of the underside of the deck plank or plating at center to a line stretched athwart the vessel from end to end of the top of the beam, and it is to be ascertained at every place where it is to be used in the measurement.

6. **HALF BREADTHS AT SIDE.**—If there be no ceiling, plating, or planking on the inside of a ship's frames, the half breadths shall be taken to the inside of the frame members.

7. **LOWEST BREADTHS ON SECTIONS.**—The bottom widths are to be taken only so far as the apparent flat of floor extends. Where there is a perceptible rise immediately from the keel, the bottom widths should be taken equal to the width of the keelson and no compensation made for the rise of floor or turn of the bilge.¹

8. **WEB-FRAME CONSTRUCTION.**—For ships constructed with web frames, at intervals of the length, the measurements should be taken to the interior faces of the ordinary frames, ignoring the greater depth of the web-frame construction.

9. **BATTENS OR SPAR CEILING.**—When the ceiling of a hold or other space is open in construction and consists of battens spaced apart, the breadths should be taken to the inside of the average thickness of battens, between points of measurement.

10. **INSULATION FOR REFRIGERATION.**—When a ship's compartments are insulated for refrigerating or other purposes and the insulating material extends inboard of the frames or above the tops of floors or inner bottom, the half breadths and heights shall be taken to the inside of the average thickness thereof.

11. **TONNAGE SECTIONS OF IRREGULAR FORM.**—When any tonnage section is of such an irregular form, due to peculiar arrangement of the inner bottom or to any other cause that the area will not be correctly produced by the ordinary method, such irregularities may be figured and added to or subtracted from the area found by the prescribed process, as the case may be.

12. **VOLUME OF RAM BOW.**—That portion of a ship forward of the No. 1 tonnage section, known usually as the ram bow, and fitted with plate framing in which lightening holes are cut, shall be figured and added to the gross tonnage, but the breadths shall be taken to lines representing the inboard sides of frames of the same depths as those used in the forward end of the ship adjacent this space. The same method shall apply in the case of a projecting stern.

¹ Attention is called to the English Merchants Shipping Act of 1894 as revised (see *Instructions Relating to the Measurement of Ships*, ed. 1913, p. 67; also par. 118, p. 43, and par. 24, p. 11), showing their method of calculating volume below decks in ships with a rise of floors.

13. CEMENT IN TONNAGE SPACES.—Where quantities of cement are used in a ship's compartments the volumes of the spaces are to be figured to the framing of the ship, as if the cement were not present.

14. BALLAST TANKS NOT INNER BOTTOM.—Peak tanks are not to be in any case exempt from measurement, and side ballast tanks are to be included in the gross tonnage, except when built without the inside of the framing of the ship; such, for instance, as the "Raylton Dixon system" of topside tanks, which may be exempted provided they are not used for cargo, stores, or fuel.

15. FEED WATER AND FUEL OIL IN BOTTOMS.—Spaces in the double bottoms made tight for reserve feed water or fuel oil are to be exempted from measurement just as is done in the case of ordinary water bottoms for ballast water.¹

16. COFFERDAMS.—The cofferdams above the protective deck and in general are not to be considered exempted spaces, but are to be measured and included in the gross figures, except when actually forming a continuation of the inner bottom and when not used for cargo, stores, or fuel, cellulose being considered cargo in warships.

17. SPACE AT AFTER END OF SHAFT TUNNEL.—The compartments through which the shaft tubes pass, abaft the tunnel and forward of the stuffing box, sometimes known as the stuffing-box compartment, will not be exempted in the figuring of tonnage, unless such space is made water-tight and forms the only inner bottom in the location considered. When forming a part of the after peak-tank space it is not to be exempted space.

18. BETWEEN DECK, POOP, AND FORECASTLE LENGTHS.—When taking measurements for lengths to the bow or stern on ships where framing is present instead of stem or sternposts, such measurement shall be taken at half the height of space concerned and to the inside of the frame, but when ceiling is fitted the length shall be taken to the inside of the average thickness thereof.

19. HEIGHTS BETWEEN DECKS.—In figuring the capacity of spaces where there occur several thicknesses of deck covering, the height shall be taken from the underside of the deck above to the average thickness of such deck planks or plates and coverings thereon as may be: *Provided*, The deck lines of the bounding decks are parallel or crowned to the same camber; otherwise the correction for difference in camber shall be made.

20. BETWEEN-DECK SPACES WITH BREAKS IN SIDES.—When figuring a space where gun sponsons, reentrant ports, or other breaks in the topside occur, the ordinates shall be taken to a line formed by a continuation of the inside line of the frames or the ceiling thereon; the volumes of the breaks shall then be calculated and added to or subtracted from the figure thus found; the result shall be considered the volume of such space.

21. SHELTER DECKS AND UPPER DECKS—DIFFERENCE BETWEEN.—Whether for the purpose of measurement a deck is to be regarded as an upper deck or as a shelter to an upper deck, is to be determined in each instance, both by the character and structural conditions of the erection and by the purpose to which the between deck is devoted. If the deck is a continuous deck, fastened down and water-

¹ The Suez Canal authorities reserve the right to alter their ruling in this connection, after careful consideration of the various types of bulk oil carriers.

tight, sealing up the cylinder formed between the two decks, and making it a fit place for the stowage of cargo, like a hold, the deck is to be treated as an upper deck, and the space between it and the deck below is to be measured. If, however, the cylinder is open to the shipment of seas, and the space is not reasonably fit for the carrying of dry cargo, but is used only for cargo generally classed as "deck loads," such as cattle, horses, chemicals, oil in barrels, etc., then, usually, the deck is to be regarded as a shelter deck, and the space as "sheltered space above the upper deck, which is under cover and open to the weather—that is, not inclosed"—and is not to be included in the recorded tonnage.

22. DEFINITION OF CLOSED-IN SPACES.—By "closed-in spaces" is to be understood spaces which are inclosed and protected from the action of the weather, even though large openings be left in the inclosure, and care will be taken that the intent of the law in this respect is not evaded.

23. PERMANENT ERECTIONS.—Poops, bridge houses, pilot houses, steering screens, or other permanent erections, entirely or partially open at sides or ends or with one or more openings in the sides, ends or in the covering deck, and not fitted with doors, hatches; or other means of closing them, or which may not be easily closed in, shall not be included in the gross tonnage, except when the spaces therein are available or actually fitted or used for cargo, stores, passengers, or crew, when they must be measured and form a part of the gross tonnage of the ship. This section must not be confounded with that portion of the rules referring to shelter or awning decks or to deck loads.

24. OPEN-DECK SPACES FOR BERTHING.—Spaces under shelter decks, such as those under bridges, etc., which are not inclosed or readily inclosed, but are fitted with hammock hooks for berthing accommodations, shall not form a portion of the gross tonnage.

25. DECK ERECTIONS—DIMENSIONS TO FRAMING.—In all cases the interior dimensions of deck spaces and erections shall be taken to the ceiling where such exists, but in the absence thereof, to the interior edge of the frames or supports for the walls of these spaces. Stiffeners on bulkheads shall be considered as supports, even though not connected to the beam above or deck below.

26. DECK ERECTIONS OF IRREGULAR FORM.—When deck spaces have irregular form, such that the general formula, indicated for the measuring of deck spaces, can not be applied to give correct results, the spaces should be subdivided into smaller portions, and each of these measured by the most convenient geometrical formula adapted thereto.

27. HAMMOCK HOUSES AND BERTHING.—All closed hammock houses and closed or readily closed hammock berthing forming erections above decks shall be figured in the gross tonnage.

28. MISCELLANEOUS SPACES.—Ammunition hoists above decks, turrets, and barbettes, conning and signal towers, inclosures of windlass, steering gear, and other spaces for working the ship, and all other such miscellaneous spaces, if within the regulations pertaining to permanent erections, shall form a part of the gross tonnage of a ship, but masts, vents, and crows, open hammock berthings, etc., are not to form a part of such gross figure.

29. **COMPANION HATCHES, SKYLIGHTS, AND ACCESS TRUNKS, ABOVE DECKS.**—Companion hatches, skylights, and access trunks, above decks, are not to be considered under the head of hatches, but are to be ignored in the gross tonnage of a ship, except when used as striking-down hatches and directly connected with or trunked down to spaces where stores or cargo are stowed. When a companion house is used as a smoking room, for instance, for the accommodation of passengers it is to be included in the gross tonnage under the head of deck houses.

30. **HATCHES FOR COAL PASSING.**—In considering the volume of hatches (in excess of one-half per cent gross) the coal hatches or skylights, for striking down bunker coal, are not to be included. All such hatches shall be omitted from the gross figure, except in cases where they are trunked down to the bunkers, when they will be included in the gross and will form a part of the machinery deduction.

31. **LIGHT AND AIR SPACES FOR MACHINERY.**—The closed or readily closed spaces for light and air or hot-air escape from machinery spaces, on or above the upper deck, shall be considered a part of and figured in the gross tonnage on approval of the request to the Commissioner of Navigation, but such spaces are in no case to be classed under hatches unless used for striking down stores or cargo.

NET TONNAGE.

In procuring the net tonnage of any United States naval ship, for Suez Canal tolls, the deductions as permitted by the canal authorities and appearing in the "Regulations for the Navigation of the Suez Maritime Canal" (ed. Jan., 1914), of which the articles below are extracts, shall be followed.

DEDUCTIONS TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE.

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net registered tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to:

SAILING VESSELS.

(1) ART. 12. For sailing vessels deduct: The spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

(2) Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

(3) The company allows the following spaces to be included in the deductions specified in article 12 of the regulations for the measurement of tonnage, provided the deductions do not, in the aggregate, exceed 5 per cent of the gross tonnage:

(a) The chart room, even when also used as a captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(b) The cabins of the ship's doctors, if actually occupied by them.

(c) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms—one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers.

A mess room, if there is one, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess room in ships having passenger accommodations which are not also provided with a passengers' mess room.

(d) All spaces fitted as bathrooms, or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(e) All spaces specially provided for the storage of electric searchlights and wireless telegraphy appliances, on condition that they are situated on the upper deck.

(4) The above-specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

(5) Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

(6) ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS.

(1) ART. 14. For vessels propelled by steam or any other mechanical power deduct:

(a) The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage.

(b) The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine rooms, and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

(2) ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

(3) Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

(a) *Ships having coal bunkers with movable partitions.*

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms and add to it for screw steamers 75 per cent and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room, together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner:

Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers.

Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown.

Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof.

Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

(b) Ships with fixed coal bunkers.

ART. 17. In ships with fixed coal bunkers measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or 2.83, if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz:

(a) The spaces framed in around the funnels.

(b) The spaces required for the admission of light and air into the engine rooms.

(c) The spaces, if there are any, necessary for the proper working of the engines.

(4) ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions as set forth in article 16 may be applied.

(5) ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage: all spaces occupied by machinery, boilers, and coal bunkers may be deducted.

Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

(6) The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

INSTRUCTIONS AND DEFINITIONS AS TO NET TONNAGE.

1. DEDUCTIBLE SPACE.—No space will be deducted from the gross tonnage, in ascertaining the net tonnage, unless it has been first included in the gross figure.

2. GENERAL DEDUCTIONS FOR QUARTERS.—All spaces for the exclusive use of the persons duly inscribed on the ship's list, with the exception of those for the commanding officer, are deductible within the reserve of the maximum allowance of 5 per cent of the gross tonnage for the total of deductions other than for propelling machinery.

3. INTERPRETATION OF RULES RELATIVE TO PASSENGERS, ETC.—Inasmuch as ships of the Navy are not engaged in commercial pursuits or fitted up for the transportation of persons unidentified with the ship's company, for pecuniary gain, the fact that a passenger or passengers are forced to use spaces intended for use of and assigned to officers shall not prevent the inclusion of such spaces in the deductions, but in general no deductions are to be made for spaces assigned to the accommodation of passengers.

4. DEFINITION OF PASSENGERS.—The admiral, his chief of staff, and flag lieutenant shall be considered passengers, as shall also officers, enlisted men, or other persons who may be aboard of but not assigned to duty with a transport, hospital ship, etc., i. e., all persons not duly inscribed on the ship's list are passengers.

5. CARGO OR STORES IN QUARTERS.—Every space occupied by officers or crew as living spaces or appropriated for their use and deducted therefor shall be kept free from stores and merchandise of

any kind, not being the personal property of those occupying such spaces, and no passengers shall be accommodated therein.

6. **DEFINITION OF CARGO.**—On ships of war the term “cargo” shall include armament, ammunition, and military and naval equipment; on transports, food, stores, luggage, accouterments, and equipment for passengers; on hospital ships, food stores for passengers, medical stores, and hospital equipment; on colliers, cargo coal and coaling gear; on repair ships, tools, parts for repairs and repair equipment; on ammunition ships, arms, ammunition, etc.; supply and refrigerator ships, cargo stores, etc.; tank steamers, cargo fuel oil; and on distilling ships, distilling machinery and distilled water.

7. **CREW'S BERTHING SPACES.**—The deductions for crew's spaces are governed by the following principles: When the greater part of a closed-in space is occupied by the mess tables, hammocks, and men's quarters, its entire area, after omitting ventilating shafts, if any, cabins, companion ways, etc., is to be deducted from the gross tonnage: *Provided*, That such parts of the space as are not occupied by mess tables, hammocks, etc., are not of such dimensions as to be available for other purposes. In the case of larger spaces, serving other purposes than as living quarters for the crew—e. g., for gun and torpedo armaments and in which hammocks and mess gear are distributed over the whole space—only that part is to be considered crew's space which is occupied by mess gear, hammocks, and crew's gear, inclusive of the space required for the use of the tables and benches. In general, only such portions of crew's spaces as are actually occupied and used by crew shall form the crew's deduction.

8. **CREW'S SPACES NOT FITTED FOR BERTHING.**—When spaces are occupied by lockers, mess tables, or other gear for the crew but are not fitted for berthing, they shall form a part of the crew's deduction, provided they are used for no other purpose than the crew's accommodation.

9. **CREW'S SPACES ON OPEN DECKS.**—When crew's hammocks are swung on open or under shelter decks, as, for instance, under bridges, etc., open at sides or ends, no deductions shall be made unless the spaces in which such accommodations exist, have been previously included in the gross figure.

10. **HAMMOCK HOUSES AND HAMMOCK BERTHING FOR CREW.**—Hammock houses and hammock berthing which is closed or readily closed shall form a part of the crew's berthing deduction, provided, however, such spaces shall have first been included in the gross tonnage.

11. **STEWARDS, COOKS, AND MESSMEN.**—Passengers, stewards, cooks, and messmen are not considered part of the crew on passenger steamers. On troop ships, transports, or other naval auxiliaries stewards, etc., who are regularly listed on the ship's complement, may be deducted for, even though at times used in the service of passengers, but in cases where such service of passengers is performed by servants shipped for the purpose no deduction shall be made.

On warships (which invariably carry no passengers except official representatives of the Government) the messmen, etc., shall be considered as forming a part of the crew, and their spaces shall be deducted for.

12. **CAPTAIN'S QUARTERS.**—The captain's quarters, when below decks, are not to be deducted for, and when above decks only such

portion thereof as is used as a chart room is to form a deduction even though permitted as a deduction in the register tonnages of some nations.

13. **PASSAGES AND OFFICER'S COUNTRY.**—Where open spaces, known as country or passage, are fitted with hammock hooks, lockers, etc., for the use of officers or crew they shall be deductible as berthing spaces, but otherwise such spaces shall form no part of the deduction, except when forming passages exclusively for access to deductible spaces.

14. **GALLEYS, BAKERIES, SCULLERIES, AND PANTRIES.**—Under the heading of "Cookhouse deduction" the galleys, bakeries, sculleries, and pantries, except spaces especially assigned to the commanding officer or fleet officers, may be included, provided they are used in the preparation of food for persons duly inscribed on the ship's list. Galleys, etc., for the accommodation of passengers will not be deducted.

15. **BATHROOMS, LAVATORIES, ETC.**—All latrines, lavatories, bathrooms, showers, urinals, and water-closets shall be deducted for, except those provided for the use of the captain or fleet officers and those assigned to passengers.

16. **MESS ROOMS.**—All mess rooms provided for persons duly inscribed on the ship's list, except the captain or fleet officers, shall form deductible space, but no passengers' mess rooms shall be deducted.

17. **SICK BAY, DISPENSARY, AND SICK-BAY BATH.**—Any spaces provided for the medical attention of the officers and crew of a ship are to form a part of the deductions thereon, but in the case of a hospital ship having spaces fitted for the transportation or treatment of others than those duly listed on the ship's complement, no such deductions shall be made therefor.

18. **DOCTOR AND MEDICAL ATTENDANTS.**—The accommodation for the doctors, apothecary, and sick attendants shall form a part of the deductions, even in cases of hospital ships, when they are duly inscribed on the ship's list.

19. **SPACES FOR WORKING SHIP.**—The windlass house, steering-gear space, conning towers, lookout houses, pilot houses, capstan spaces, signal spaces, wireless rooms, etc., shall be deducted when located above the deck covering the highest between deck, or when, perhaps, under a simple shelter deck; but when below decks such spaces are not to be deducted.

20. **DONKEY BOILER AND ENGINE.**—The donkey boiler and engine, when in an inclosed space above decks and when connected up with any or all of the auxiliaries—for instance, pumps, steering gear, anchor gear, windlass, capstan, etc.—is to be deducted; but when also used for the purpose of hoisting cargo, as in some merchant ships, it does not form deductible space, except in the case of men-of-war or troop ships, which do not carry cargo for commercial purposes.

21. **STEERING-ENGINE SPACES AND WINDLASS-ENGINE SPACES.**—The spaces for the steering and windlass engines, etc., are to form a part of the miscellaneous deductions for working the ship, provided they are situated above the uppermost deck; and if located in open space and not bulkheaded off a maximum space of 3 feet on each side for access and attendance will be permitted.

22. **SIGNAL SPACES AND LAMP ROOM.**—Signal towers or inclosed signal stations above decks may be deducted when used only for signals or signal apparatus connected with the ship, and when the lamp room is above and used for signal lamps only the same may be deducted under this heading.

23. **BALLAST TANKS.**—Peak tanks and side ballast tanks are in no case to be deducted from the gross tonnage, although such deductions are permitted in the national tonnage of several countries, but in certain cases topside tanks form exempted space.

24. **SAIL ROOMS AND BOATSWAIN'S STORES.**—Sail rooms and boatswain's stores do not form deductible spaces under these regulations, even though they be deducted for under the national tonnages of the several countries.

25. **CLEANING-GEAR SPACES.**—The places provided for the stowage of deck gear and other articles used in cleaning the ship are not to form a part of the deductions under these rules.

26. **LAUNDRY, ICE MACHINE, AND REFRIGERATOR SPACES.**—Laundries, ice machines, and refrigerator spaces are not to form a part of the deductions under these rules, even though provided only for the officers and crew.

27. **OFFICES AND STOREROOMS.**—Offices provided on a ship for the transaction of routine business, except, perhaps, the doctor's office, are not to be deducted for, and no storerooms are to form a deduction, except, possibly, the navigator's and signal storerooms, and then only when above decks.

28. **PRISONS AND BAND ROOMS.**—Prisons and band rooms do not usually form deductible space. When the band room is fitted up for the berthing, messing, or living quarters of the band, a deduction may be made for such portions thereof as are so used.

29. **PROPELLING-POWER DEDUCTION.**—In ascertaining the amount of deduction for propelling power, whichever of the rules¹ (a) or (b) produces the greater deduction for propelling power shall be used.

(a) The actual engine, boiler, shaft alley, and light and air spaces as measured, plus 75 per cent of these spaces for screw steamers and plus 50 per cent for paddle steamers; or,

(b) The actual measurement of the above spaces, plus the actual measurement of the permanent bunkers, which can not be extended or increased in size.

30. **MOTIVE POWER OTHER THAN STEAM.**—In ships provided with motive power other than steam the machinery spaces shall be measured and deducted under Article 14 of the Suez Rules.

31. **GOODS OR STORES IN MACHINERY SPACES.**—No goods or stores shall be carried in any spaces measured and deducted for propelling power; but spare parts, tools, oil, waste, and the like may be carried in machinery spaces, provided they are not within bulkheaded spaces, separated off from the machinery space proper.

32. **CABINS OR STOREROOMS IN MACHINERY SPACES.**—When cabins, engineers' storerooms, etc., are located in machinery spaces, they shall not form a part of the propelling-power deductions, but shall be omitted therefrom.

¹ The Danube rule.

33. **ENGINEERS' WORKSHOP, DYNAMOS, AND DISTILLERS.**—The engineers' workshop, dynamos, and distillers are not to form a part of the propelling-power deductions in a steamship, unless located directly in a machinery space and not bulkheaded off therefrom; but when a distiller is used only for the preparation of potable water for the crew and not used for making steaming water the space therefor may be deducted under the 5 per cent reserve clause for miscellaneous spaces.

34. **CRANK PITS AND POCKETS.**—All crank pits, pockets, etc., for main and auxiliary machinery in the engine and boiler rooms shall form a part of the propelling-power deductions.

35. **AUXILIARY MACHINERY IN PROPELLING-POWER SPACES.**—When auxiliary machinery is located in the propelling-power spaces it shall be included in the deduction for the propelling power, but shall not be entitled to a separate deduction under any other head.

36. **DONKEY BOILER IN PROPELLING SPACE.**—If the donkey engine and boiler are within the boundary of the machinery space, and are used in connection with the main machinery, they are to be included in the propelling-power deduction, and the space occupied by them shall not be entitled to a separate deduction in addition.

37. **MACHINERY OR FITTINGS IN FIDLEYS.**—Whenever machinery or fittings are located in the engine or boiler room uptake casings, and no bulkhead incloses them except the casings bulkhead, the whole or entire volume of these uptake spaces shall form a portion of the deduction for propelling power, but when the auxiliary machinery is bulkheaded off from the rest of the space, such portions as may have been inclosed for such machinery or fittings shall not form a portion of the propelling-power deduction.

38. **ENGINE AND FIREROOM BLOWER.**—When blowers for machinery spaces are located in, or are in a compartment adjacent to, the machinery spaces they shall form a part of the machinery deduction of the ship; in general, all spaces for the ventilation of machinery compartments situated below the upper deck are considered as forming a part of the propelling-power deduction.

39. **AIR CASINGS.**—When machinery spaces are fitted with air casings, the air spaces are to be included in the propelling-power deductions, as they form part of the ventilation of such spaces.

40. **LIGHT AND AIR CASINGS NOT EXTENDING TO TOP OF INCLOSED SPACE.**—Whenever, in the case of an otherwise inclosed superstructure, large but readily closed openings surrounding the funnels are provided in the cover deck and the entire volume of such space is figured in the gross tonnage, only such portions of the light and air casings from the boiler and engine rooms as may actually extend into such spaces shall be figured in the propelling-power deductions.

41. **LIGHT AND AIR SPACES ABOVE DECKS.**—All portions of light and air spaces to propelling machinery up to the gratings or plates covering them are to be included in the machinery deduction, even such portions as extend above the deck inclosure, provided they have been included in the gross tonnage.

42. **MOVABLE BUNKERS.**—When the "Danube rule" is not used, but actual bunker space as well as actual machinery is measured and deducted, the bunkers are to be measured separately and added

The following spaces are not to form part of machinery deduction when bulkheaded off from machinery space proper or forming a separate space therefrom:

- | | |
|------------------------------------|--|
| 1. Dynamo rooms. | 5. Donkey engine and boiler when not in or immediately adjacent to machinery spaces. |
| 2. Distiller spaces. | 6. Staterooms in machinery spaces. |
| 3. Engineers' workshop. | |
| 4. Storerooms in machinery spaces. | |

REFERENCES.

For reference in connection with the question of tonnage, see—

- (a) United States Statutes at Large, Revised Statutes United States, Nos. 4150 to 4154, pages 803 to 806.
- (b) Supplement, Revised Statutes United States, volume 1, act of August 5, 1882, page 378, chapter 398, act of June 19, 1886, page 494, chapter 421, section 5.
- (c) Supplement, Revised Statutes United States, volume 2, act of March 2, 1895, page 407, chapter 173.
- (d) United States Statutes at Large, volume 35, part 1, Public Laws, act of February 6, 1909, page 613, chapter 82, section 1.
- (e) Customs Regulations, 1908. (Treasury Department.)
- (f) Navigation Laws, United States, 1911 (corrected). (Department of Commerce and Labor).
- (g) Instructions relating to the measurement of ships, 1913. (British Board of Trade.)
- (h) Regulations for the Navigation of the Suez Maritime Canal, 1914.
- (i) Translation (Naval Intelligence). Instructions for the measurement of ships. (German.)
- (j) Responses aux Questions de Tonnage concernant les Navires de Guerre. (C. & R. No. 6215A21 to 25.)
- (k) Letter, Bureau of Navigation, Department of Commerce and Labor. (C. & R. No. 6563A7 and 8.)
- (l) Letter No. 6215A19 and 20 in re rulings of the Suez Co.
- (m) Report on certificate, U. S. S. *New York* (6215A8).
- (n) Copy of Suez certificate for the U. S. S. *Abarenda* (25945E3).

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